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October 1999 (No. 82)



Climate and Marine Department
Japan Meteorological Agency

気象庁 気候・海洋気象部

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気象庁海洋月報は、気象庁 気候·海洋気象部 海洋課で作成しています。

本月報に関する問い合わせは、

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Monthly Ocean Report is prepared by the Oceanographical Division, Climate and Marine Department, Japan Meteorological Agency.

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表紙は、1999年10月の太平洋の月平均海面水温偏差図です。

陰影部は、平年より高温の海域を示しています。

The figure on the front cover shows the monthly mean SST anomalies for October 1999 in the Pacific Ocean.

Areas of positive anomalies are shaded.

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海況の特徴（１９９９年１０月）

日本近海の海況

海面水温は、日本海北部を除いてほぼ全域で平年より0.5℃以上高く、35゜N に沿った145゜E以東では平年より2℃以上高かった（第４図、第12図）。

黒潮は、上旬は九州から室戸岬にかけて、中・下旬は九州から足摺岬にかけて接岸していた。上旬に紀伊半島沖にあった小蛇行は、中旬から下旬にかけてその規模を大きくして東に移動し、下旬には蛇行の南端が32゜N、137゜E付近まで達した。東海沖以東では上旬は伊豆半島に接近した後、三宅島付近を東南東に、中・下旬は三宅島付近を北東に流れた後、房総半島沖を北東に流れていた（第9図）。

親潮系の冷水の沖合の分枝は39.5゜N、146.5゜Eまで達していた（第5図）。

太平洋の海況

太平洋赤道域の海面水温は、155゜Eから90゜Wにかけて平年より低く、140゜W付近と130゜Wから110゜Wにかけての海域では-1℃を超える負偏差域が見られた。一方、145゜E以西では平年より0.5℃以上高かった。

北太平洋では、35゜Nに沿った150゜W以西で平年より1℃以上高かった。20゜Nに沿った170゜Eから130゜Wにかけての海域と北米西岸沖では平年より0.5℃以上低かった（第16図）。

Highlights October 1999

Seas adjacent to Japan

SSTs were more than 0.5°C above normal in the entire domain around Japan, except in the northern part of the Japan Sea. Positive SST anomalies exceeding +2°C were found east of 145°E along 35°N (Fig. 4 and Fig. 12).

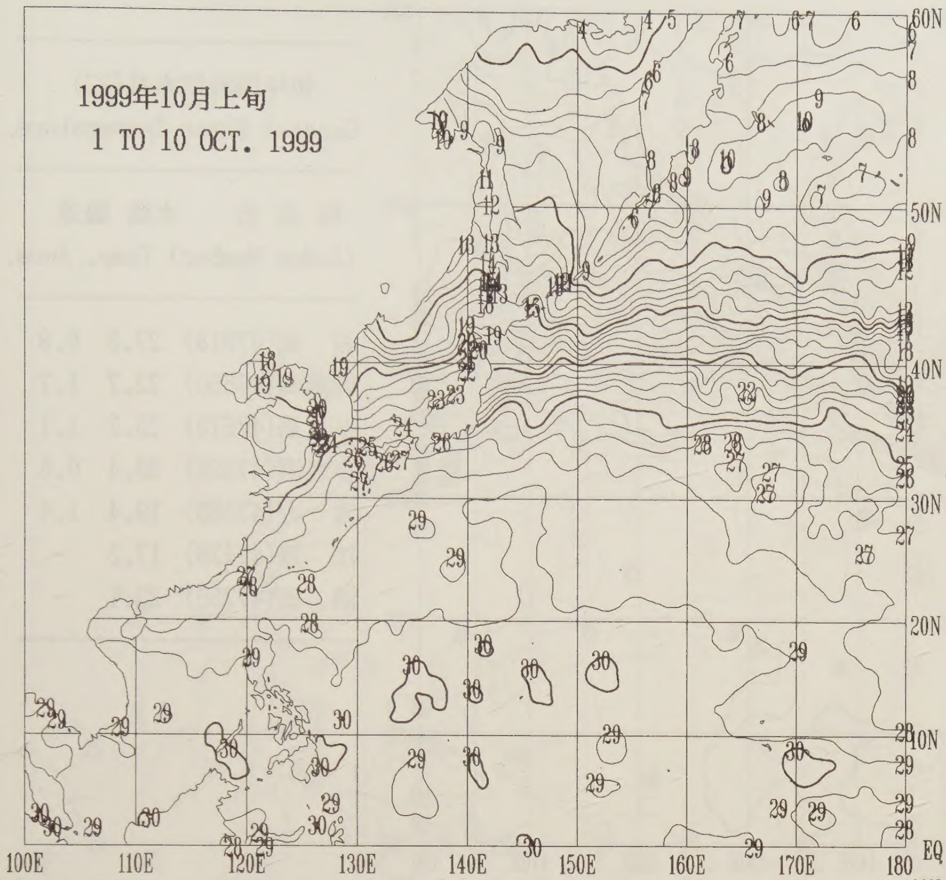
The Kuroshio flowed along the coasts from Kyushu to Muroto-misaki during the first 10-day of the month, and along the coasts from Kyushu to Ashizuri-misaki during the second and last 10-day. A small meander, which was found off the Kii Peninsula in the first 10-day, moved eastward and enlarged during the month. The southernmost position of the meander approached 32°N ,137°E in the last 10-day. East of the seas off Tokai, the Kuroshio flowed close to the Izu Peninsula and turned ESE-ward near Miyake Island for the first 10-day, and flowed NE-ward near Miyake Island during the rest of the month. It flowed NE-ward off the Boso Peninsula (Fig. 9).

Off-coastal branch of the Oyashio cold water extended southward to 39.5°N, 146.5°E (Fig. 5).

Pacific Ocean

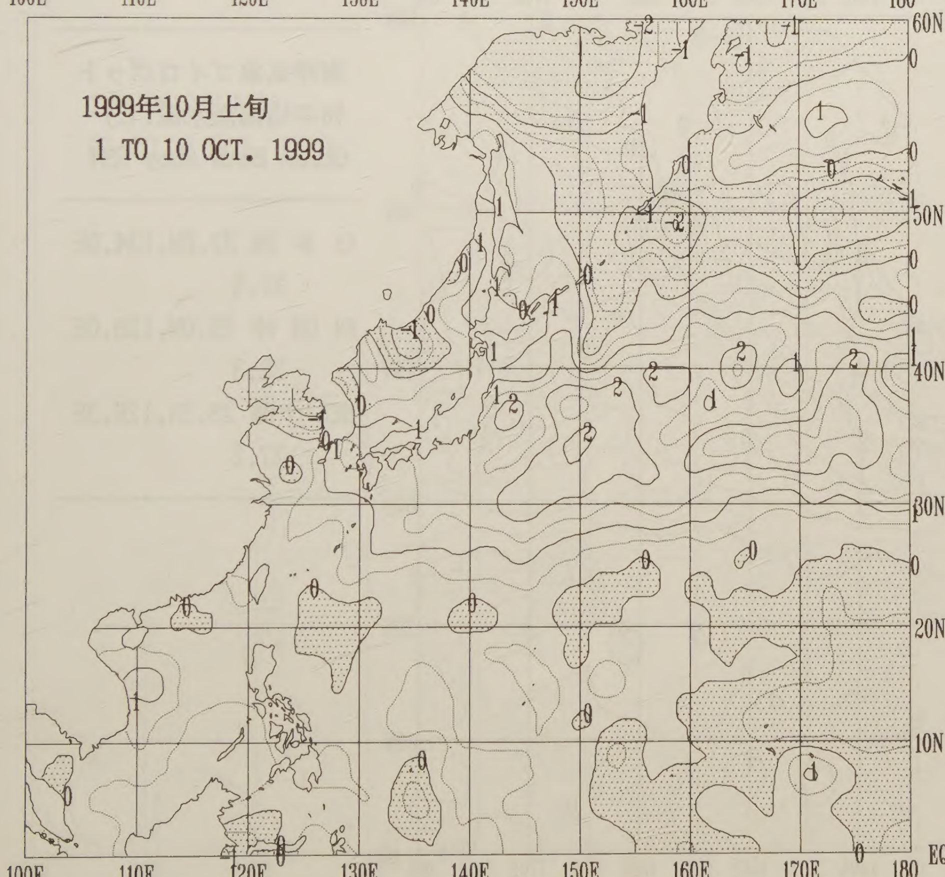
In the equatorial Pacific, negative SST anomalies prevailed from 155°E to 90°W, and those exceeding -1°C were found around 140°W and from 130°W to 110°W. SSTs were more than 0.5°C above normal west of 145°E.

In the North Pacific, positive SST anomalies exceeding +1°C prevailed west of 150°W along 35°N. Negative SST anomalies exceeding -0.5°C were found from 170°E to 130°W along 20°N and off the west coast of North America (Fig. 16).



旬平均沿岸水温(℃)
Coastal Water Temperature

地点名 (Index Number)	水温 Temp.	偏差 Anom.
石 垣(47918)	27.9	0.6
御前崎(47655)	24.3	2.1
八丈島(47678)	26.4	1.4
小名浜(47598)	21.6	1.0
宮 古(47585)	20.1	1.4
江 差(47428)	19.5	-
浜 田(47755)	24.1	-



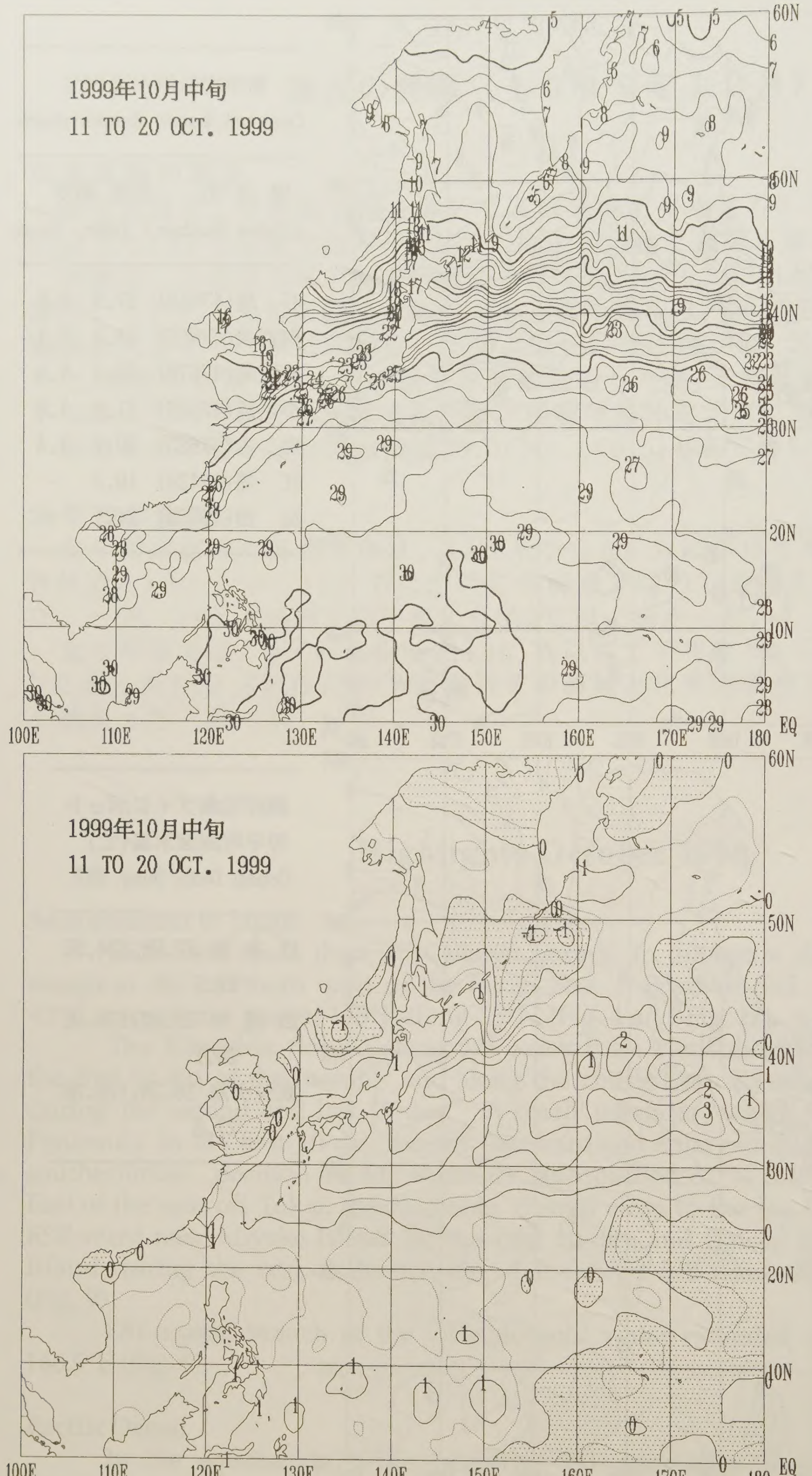
海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

日本海	37.9N,134.5E	22.5
四国沖	29.0N,135.0E	29.1
東シナ海	28.2N,126.3E	27.6

第1図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1999年10月上旬)

Fig.1 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 1st ten-day period in OCT 1999. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.

Ten-day mean SST & Anomalies



旬平均沿岸水温(℃)
Coastal Water Temperature

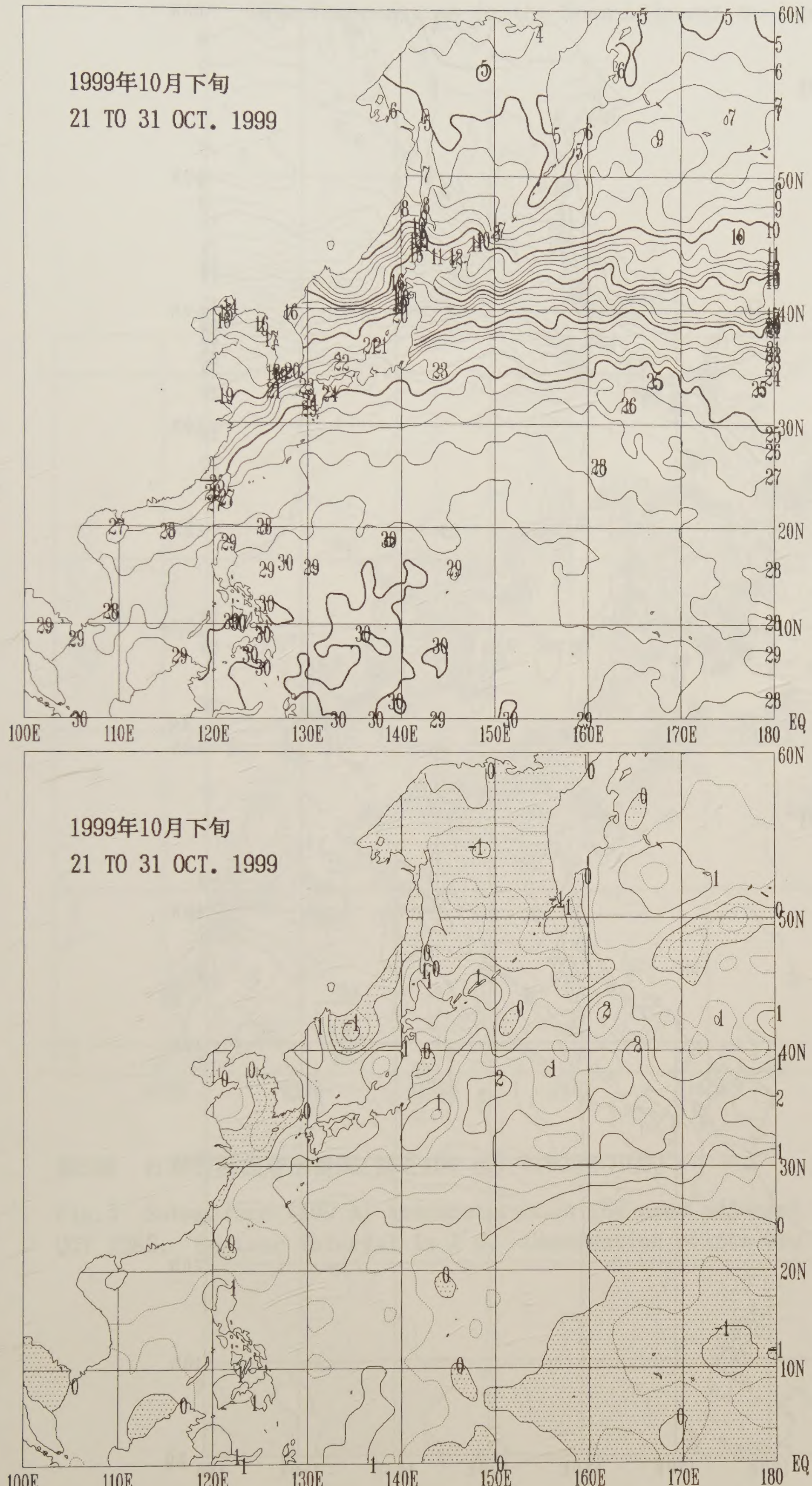
地点名 (Index Number)	水温 Temp.	偏差 Anom.
石 垣(47918)	27.5	0.9
御前崎(47655)	22.7	1.7
八丈島(47678)	25.2	1.1
小名浜(47598)	20.4	0.8
宮 古(47585)	19.4	1.4
江 差(47428)	17.3	-
浜 田(47755)	23.1	-

海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

日本海	37.9N,134.5E	21.4
四国沖	29.0N,135.0E	28.3
東シナ海	28.2N,126.3E	27.2

第2図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1999年10月中旬)

Fig.2 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 2nd ten-day period in OCT 1999. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.



旬平均沿岸水温(℃)		
Coastal Water Temperature		
地点名 (Index Number)	水温 Temp.	偏差 Anom.
石　垣(47918)	26.1	0.4
御前崎(47655)	20.9	1.3
八丈島(47678)	23.3	-0.1
小名浜(47598)	18.5	0.0
宮　古(47585)	17.7	0.8
江　差(47428)	16.1	-
浜　田(47755)	21.7	-

海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

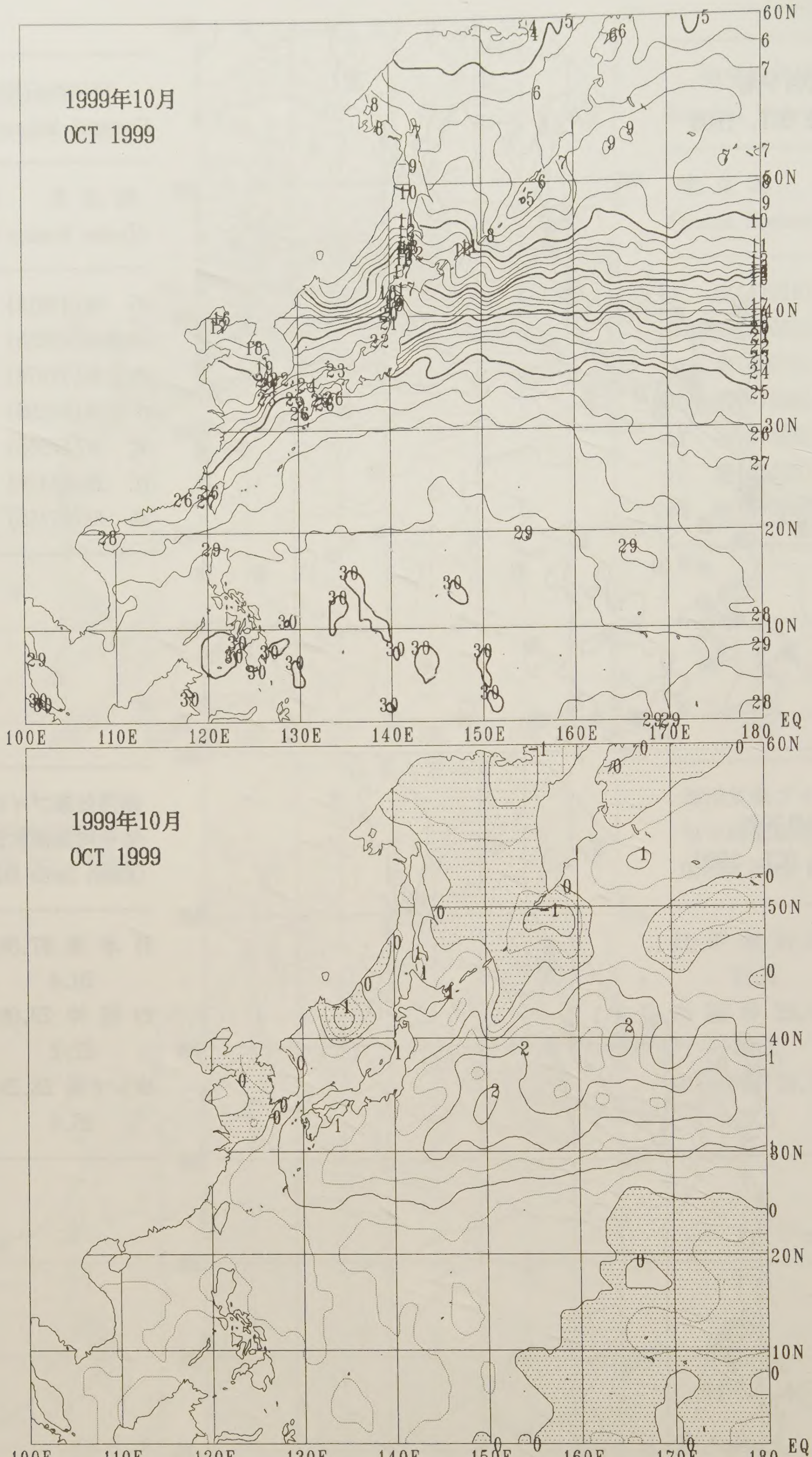
日本海 37.9N,134.5E
20.8

四国沖 29.0N,135.0E
27.2

東シナ海 28.2N,126.3E
26.0

第3図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1999年10月下旬)

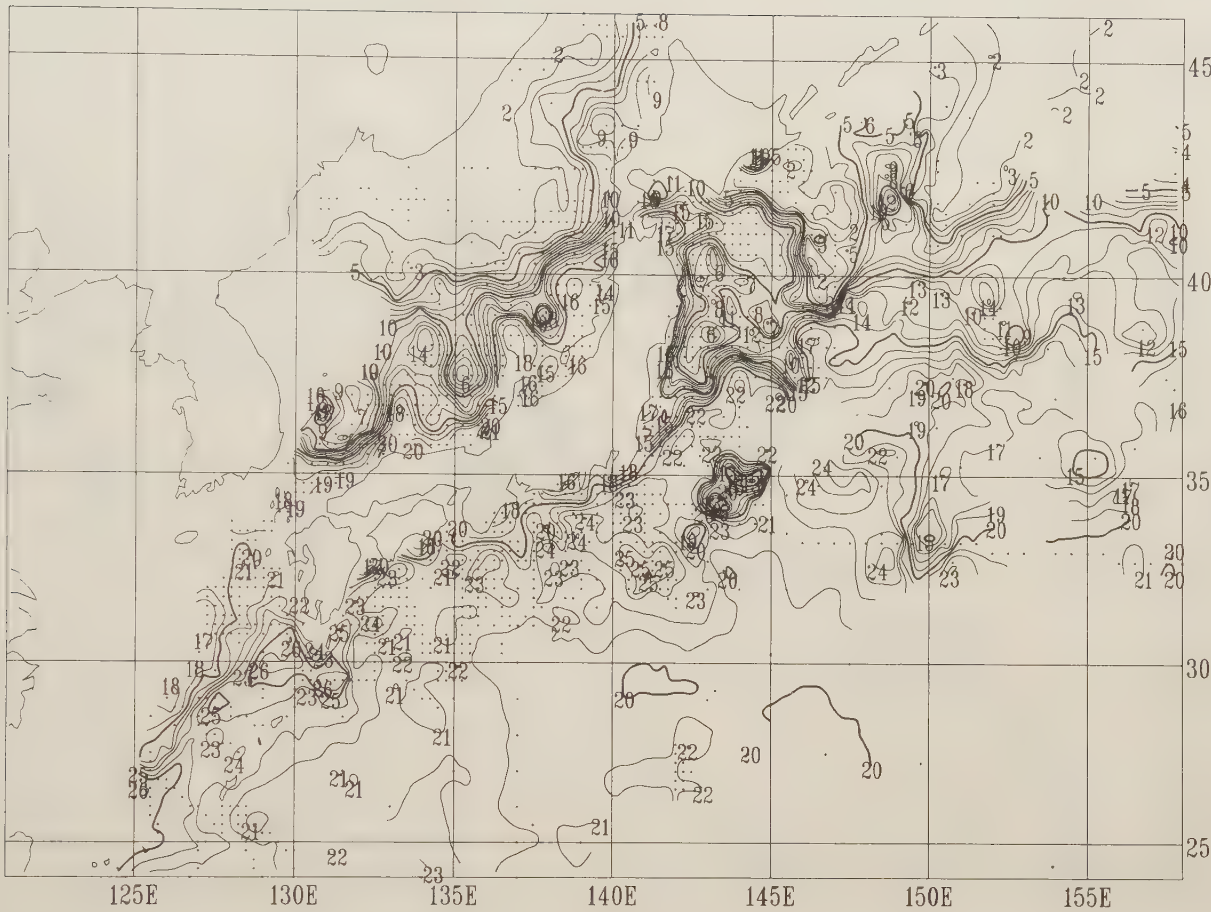
Fig.3 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 3rd ten-day period in OCT 1999. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.



第4図 北西太平洋月平均海面水温図(上)及び偏差図(下)(1999年10月)

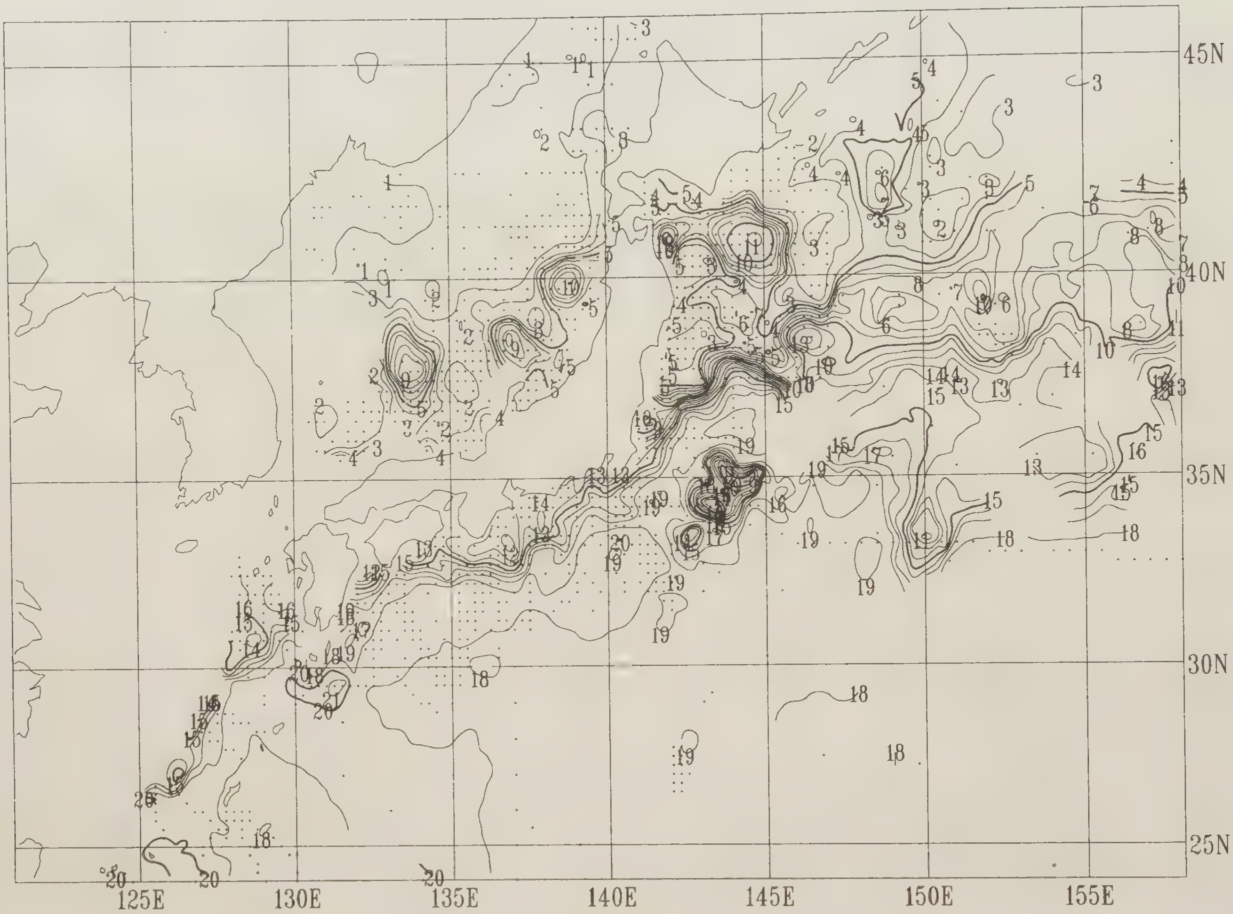
Fig.4 Monthly mean SST (top) and anomalies (bottom) in the western North Pacific for OCT 1999. Anomalies are computed from the JMA climatology (1961-1990). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.

100m Temperatures in the Seas Adjacent to Japan



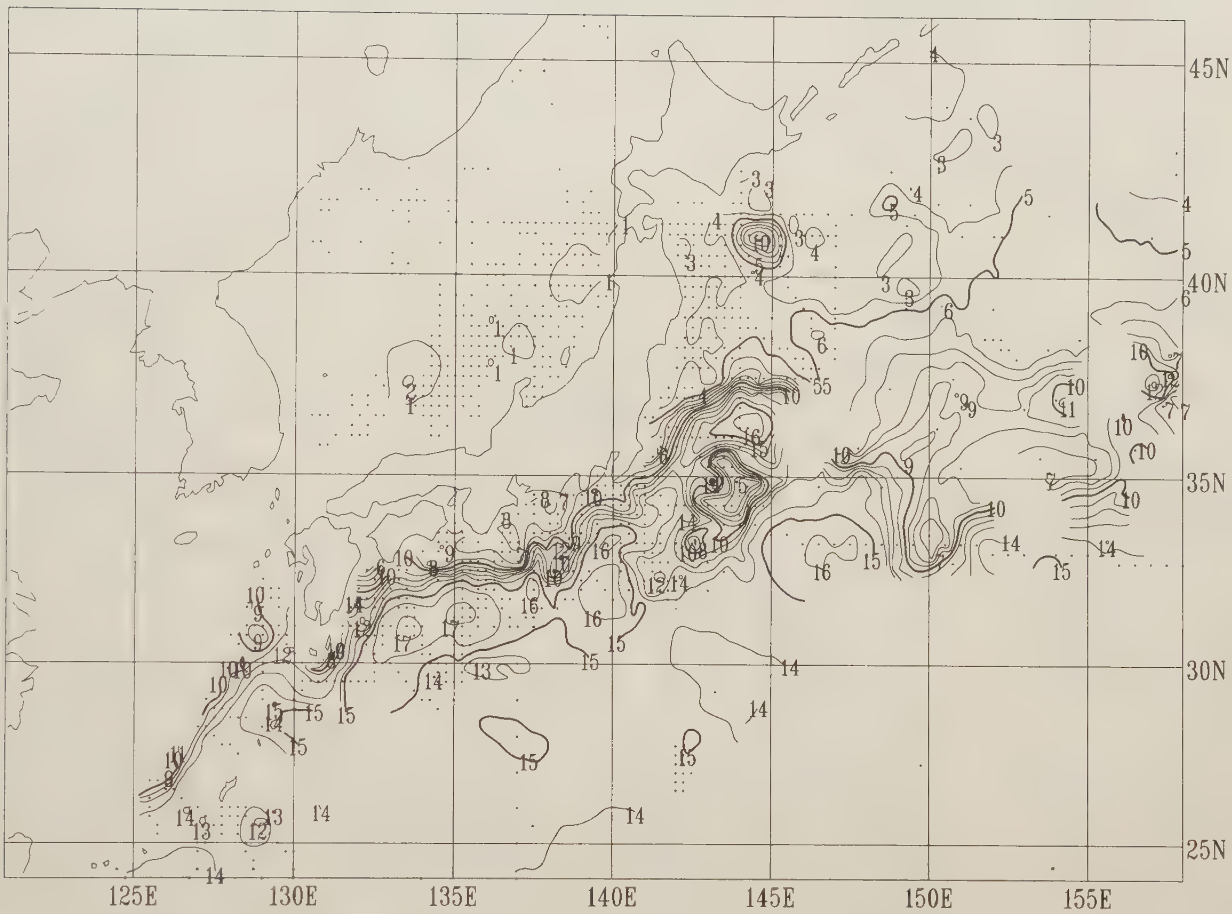
第5図　日本近海表層水温図(深さ100 m) (1999年10月)

Fig.5 Subsurface (100 m) temperatures in the seas adjacent to Japan for OCT 1999. Contour interval is 1°C. Observation points are denoted by dots.



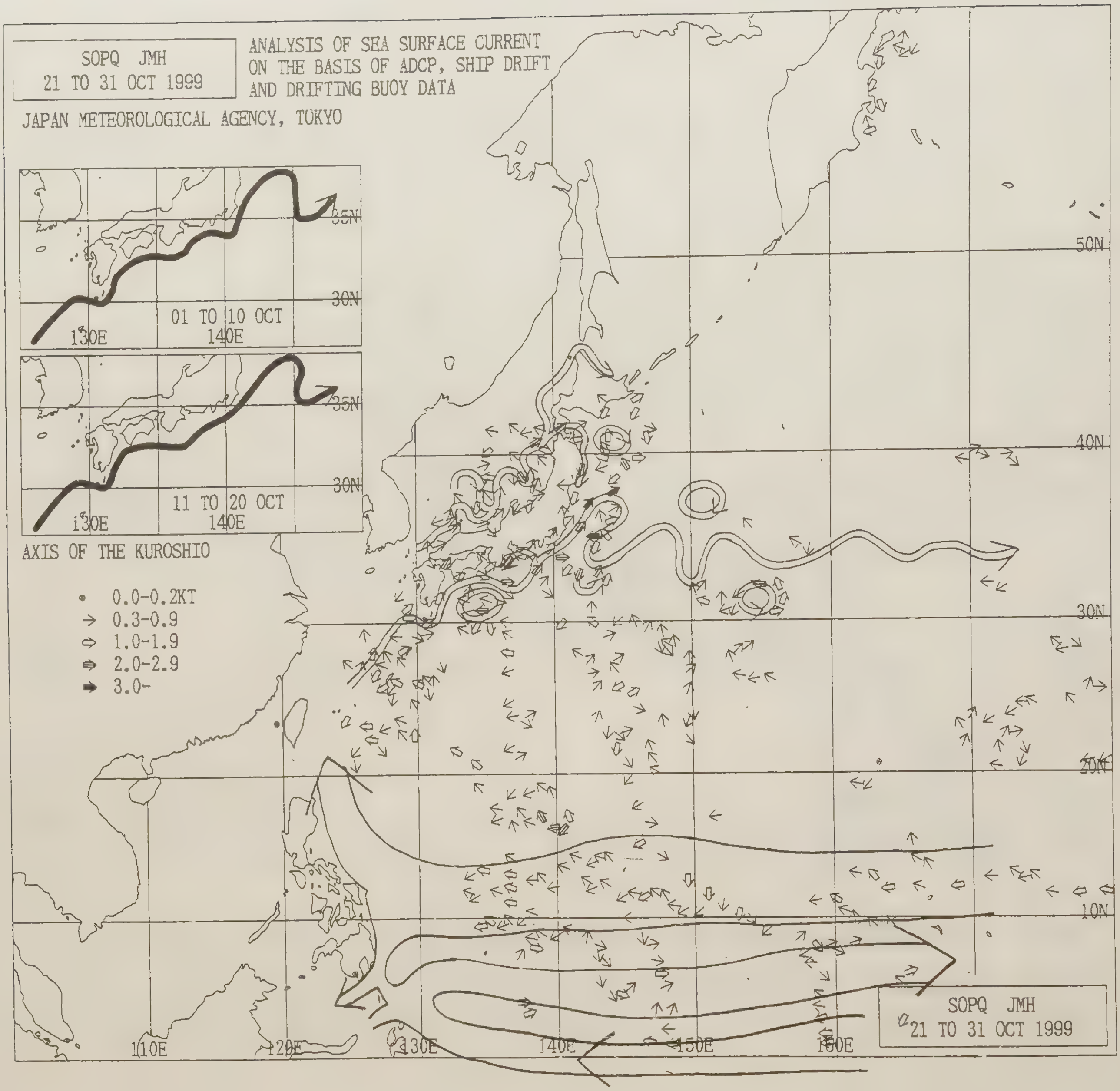
第6図　日本近海表層水温図(深さ200 m) (1999年10月)

Fig.6 Subsurface (200 m) temperatures in the seas adjacent to Japan for OCT 1999. Contour interval is 1°C. Observation points are denoted by dots.



第7図　日本近海表層水温図(深さ400 m) (1999年10月)

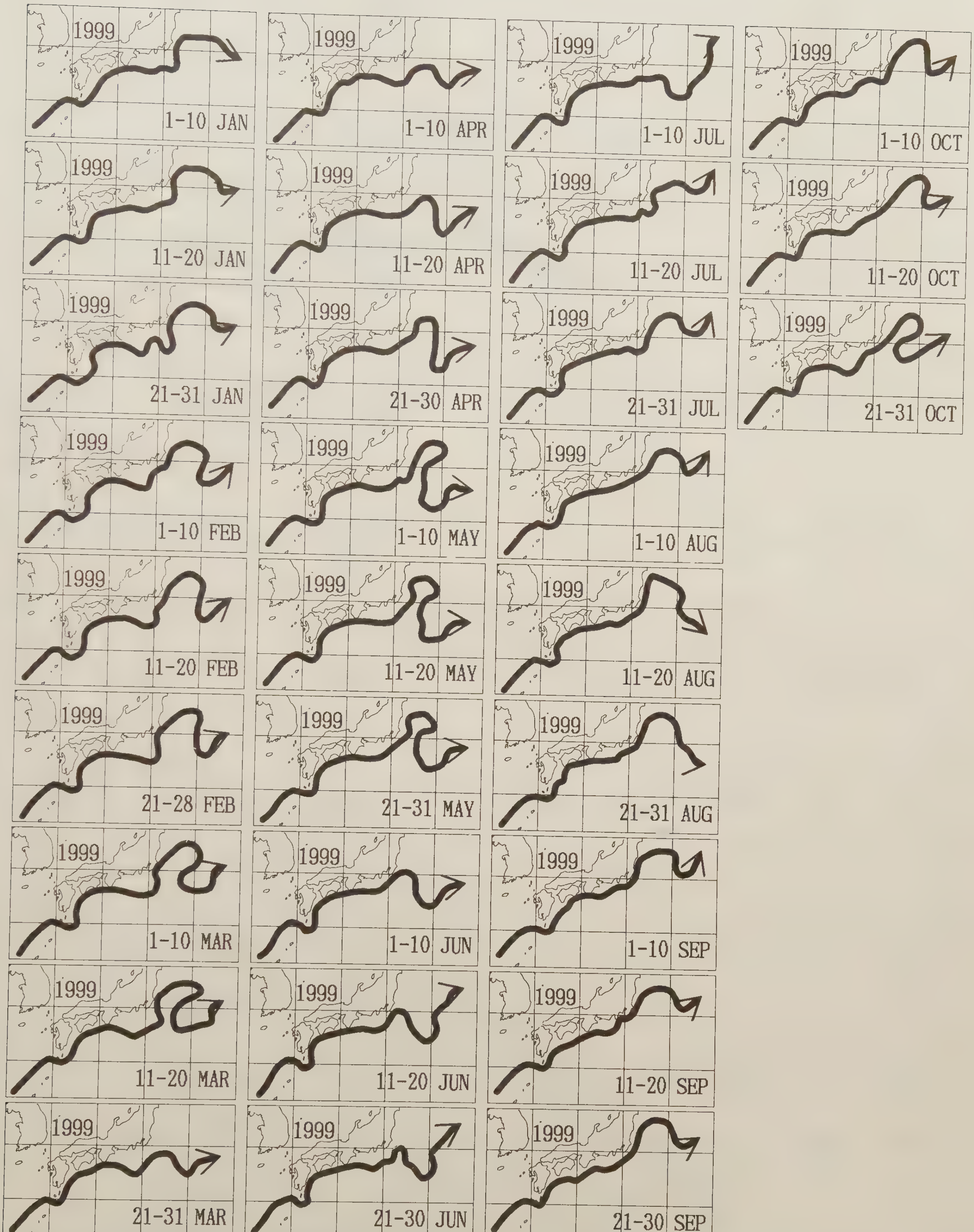
Fig.7 Subsurface (400 m) temperatures in the seas adjacent to Japan for OCT 1999. Contour interval is 1°C. Observation points are denoted by dots.



第８図　北西太平洋海流図（1999年10月下旬）

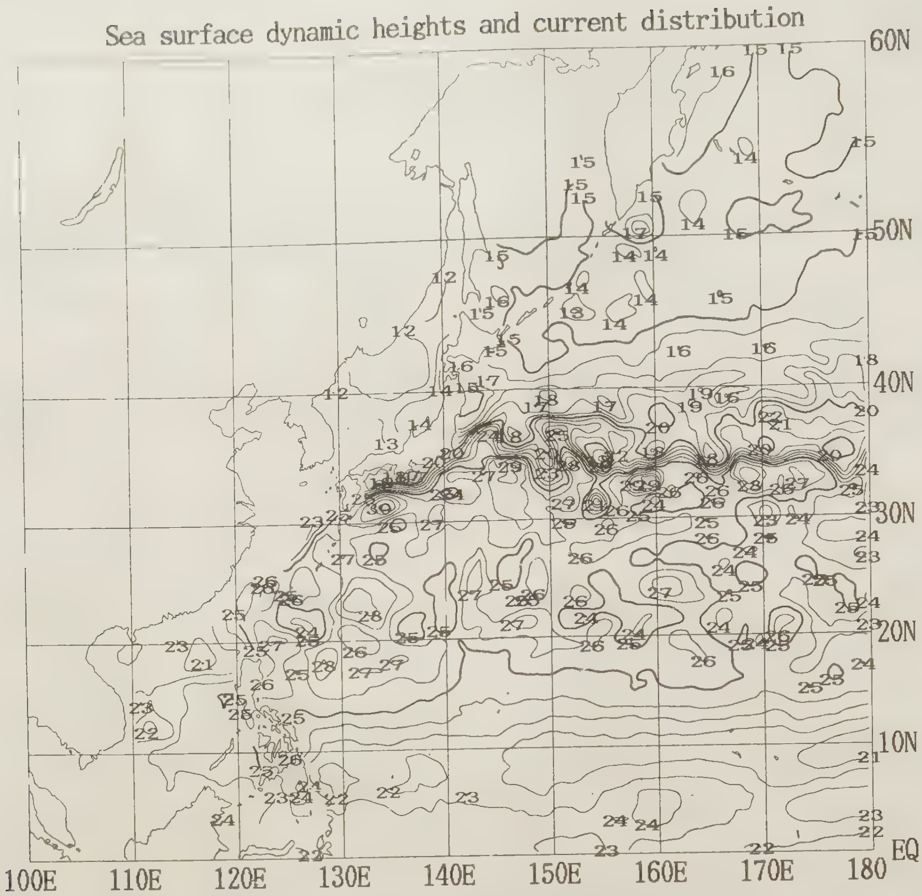
Fig. 8　Analysis of the sea surface current in the western North Pacific for the 3rd ten-day period in October 1999. Small arrows indicate *in situ* observations. Major currents such as the Kuroshio and the North Equatorial Current are denoted by larger open arrows.

Location of the Kuroshio axis



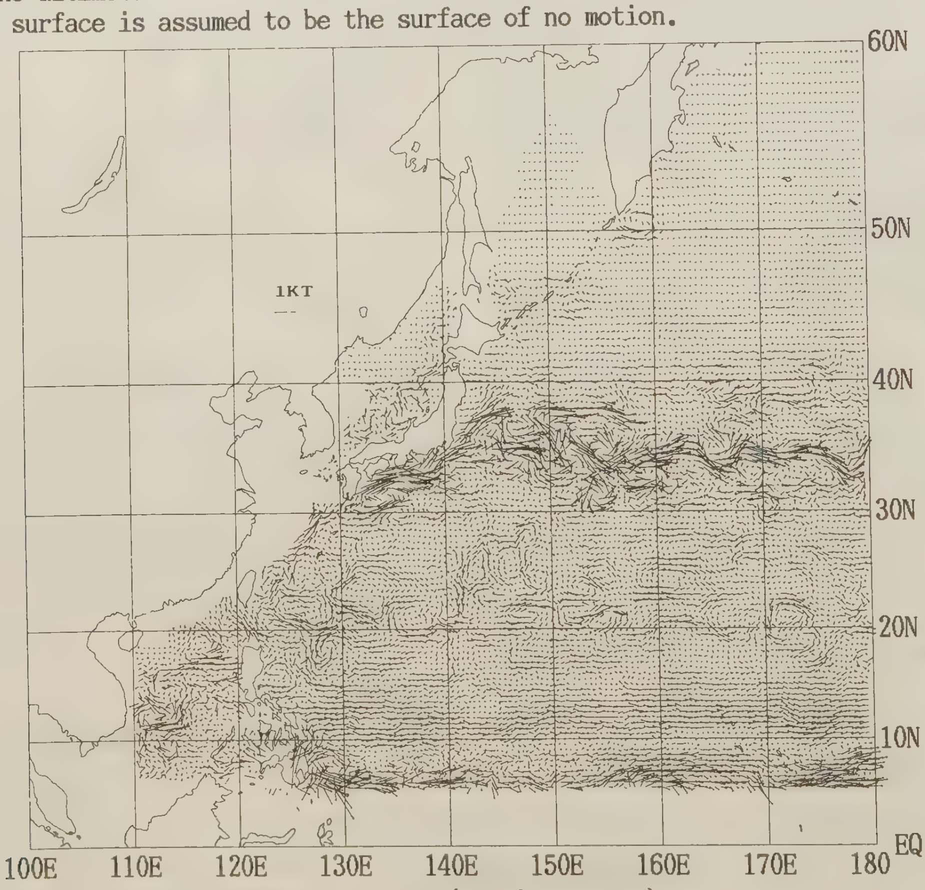
第9図 旬別黒潮流軸図

Fig.9 Location of the Kuroshio axis.



第10図 北西太平洋力学的海面高度分布図(1999年10月27日)

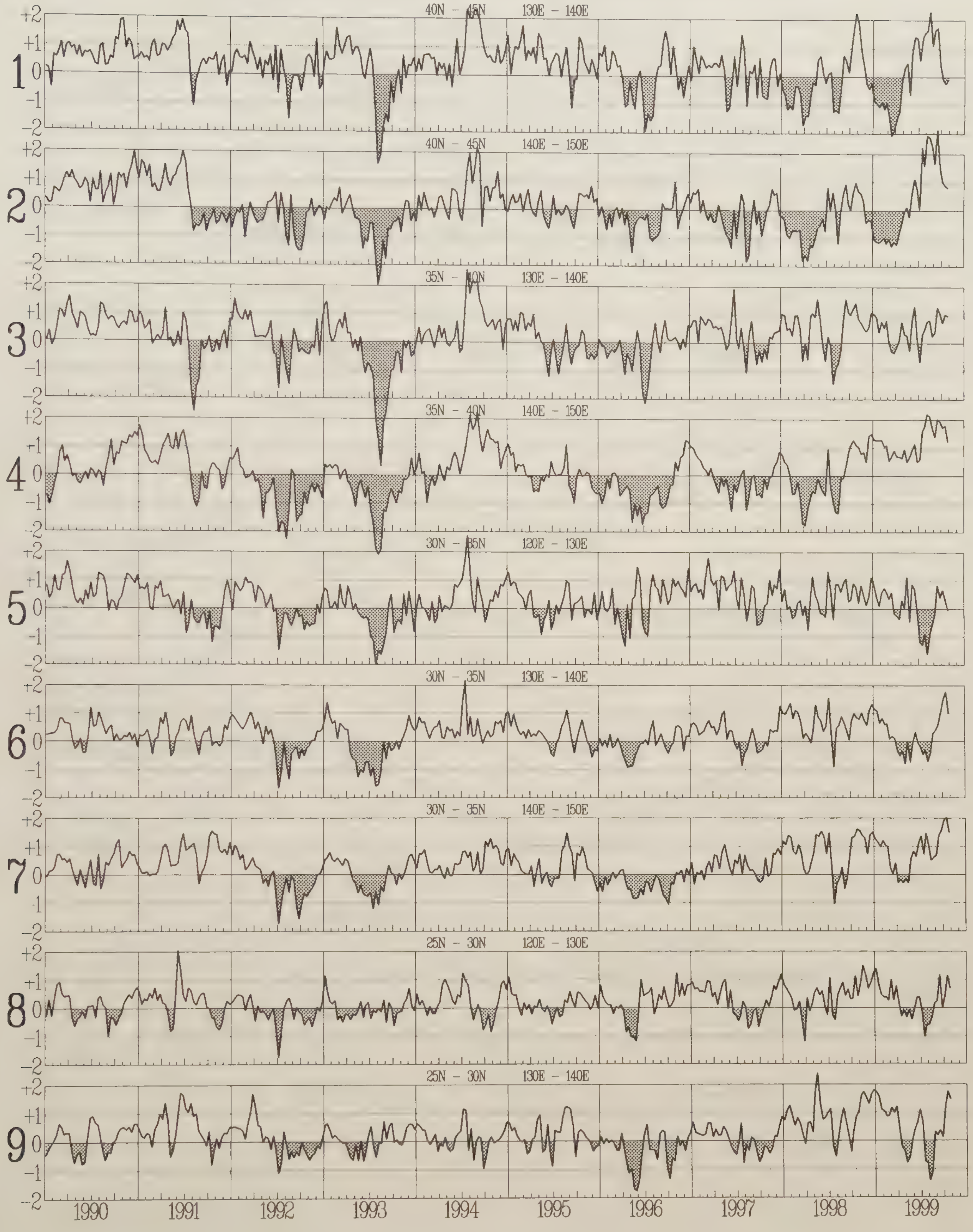
Fig.10 Sea surface dynamic heights (10cm) in the western North Pacific derived from the altimeter data of TOPEX/POSEIDON (OCT 27, 1999).
1500db surface is assumed to be the surface of no motion.



第11図 北西太平洋海流ベクトル図(1999年10月27日)

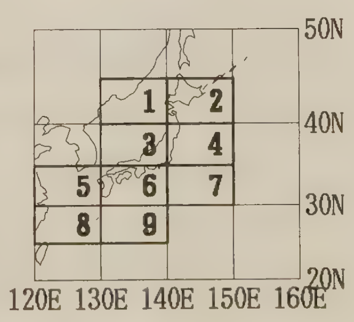
Fig.11 Sea surface current vectors in the western North Pacific (OCT 27, 1999). Vectors are derived from the sea surface dynamic heights from TOPEX/POSEIDON and subsurface temperature distribution assuming the geostrophic relation.

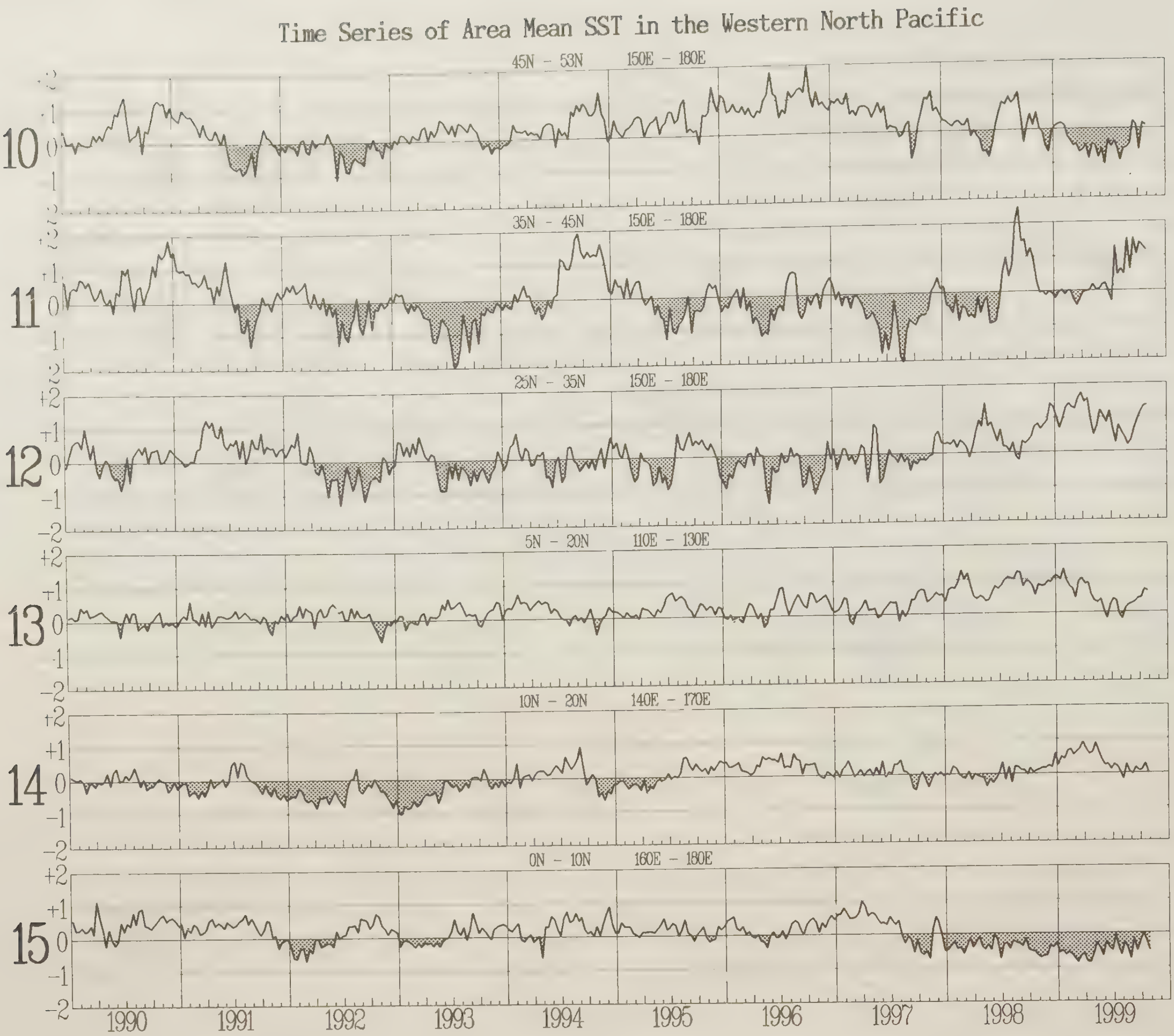
Time Series of Area Mean SST in the Western North Pacific



第12図　海域別旬平均海面水温平年偏差時系列図

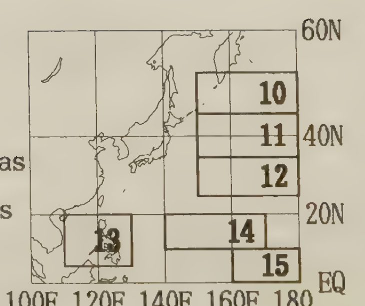
Fig.12 Time series of the ten-day mean sea surface temperature anomalies (°C) in the western North Pacific for the areas shown in the right panel. Negative anomalies are shaded. Anomalies are computed from the JMA climatology (1961-90).

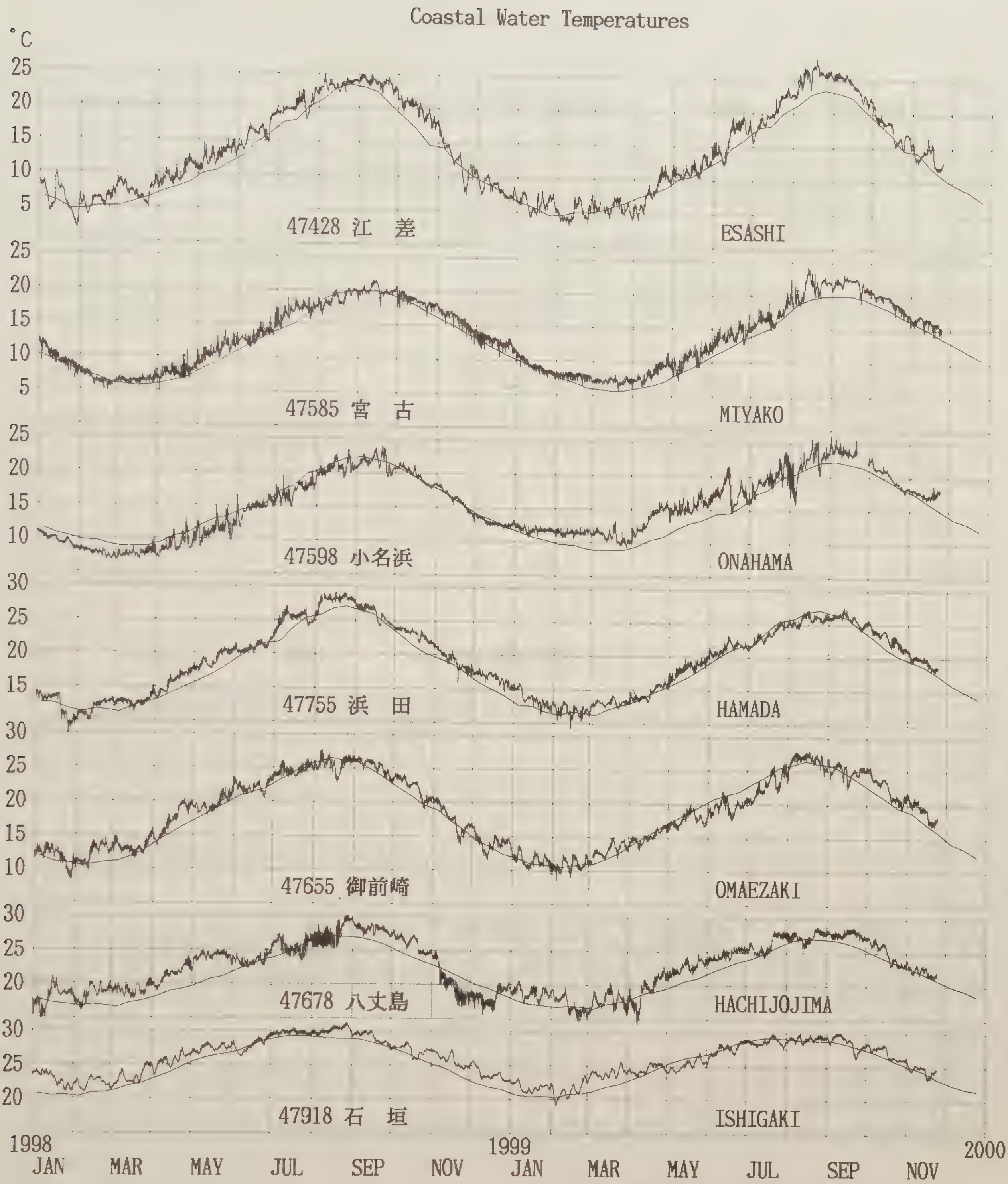


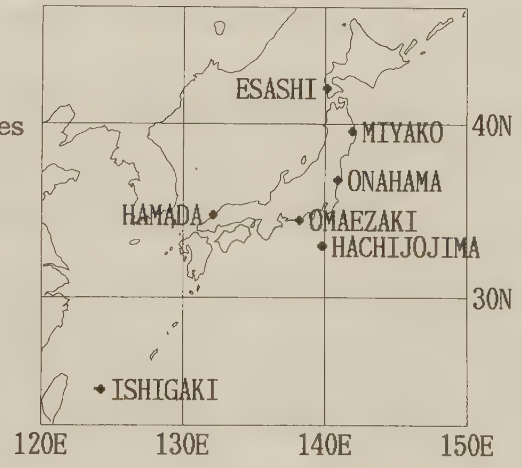


第12図　海域別旬平均海面水温平年偏差時系列図（つづき）

Fig.12 (continue) Time series of the ten-day mean sea surface temperature anomalies (°C) in the western North Pacific for the areas shown in the right panel. Negative anomalies are shaded. Anomalies are computed from the JMA climatology (1961-90).

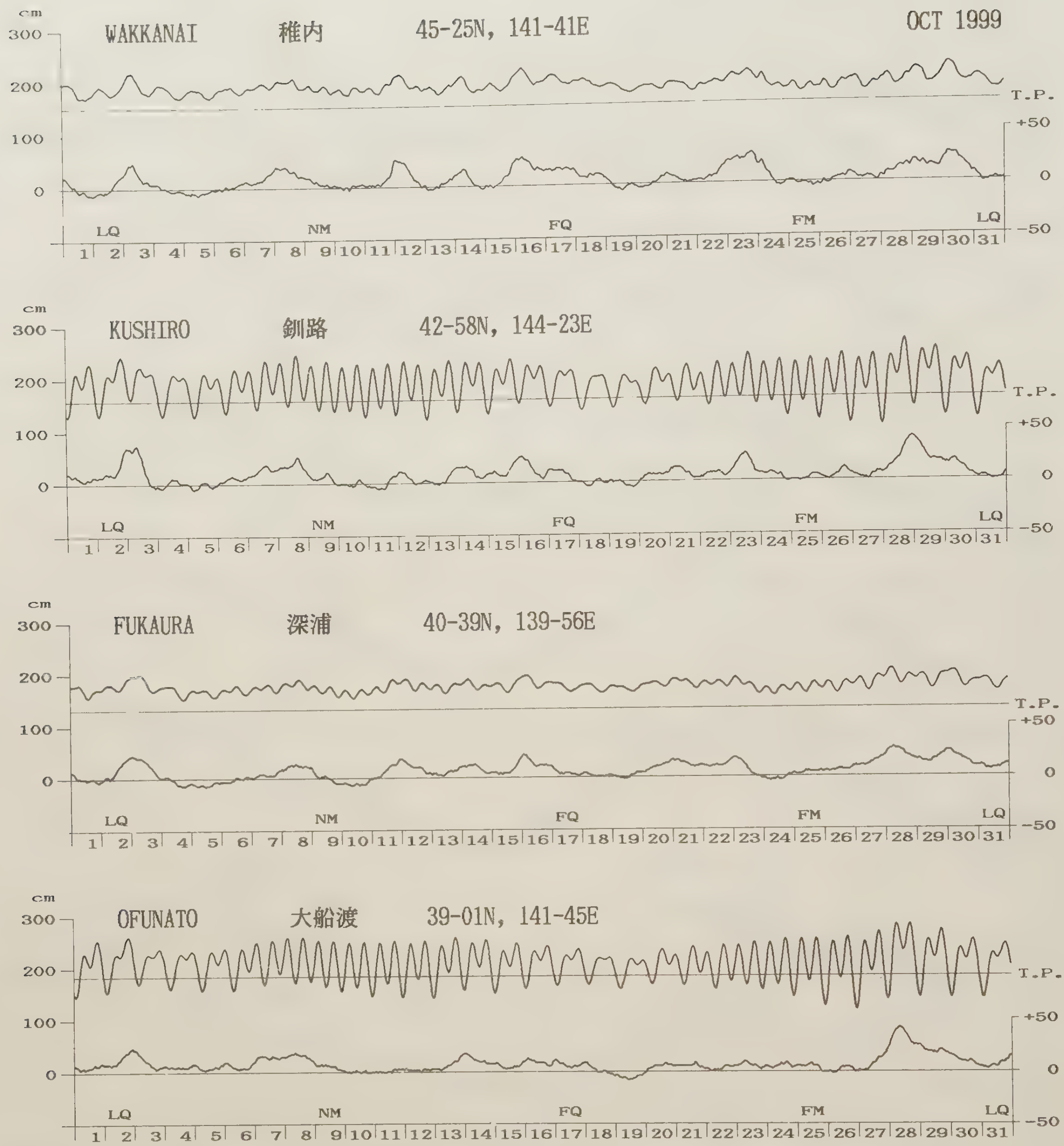






第13図 沿岸水温時系列図

Fig.13 Time series of hourly coastal water temperatures (°C) measured at 7 coastal stations of the JMA shown in the right panel.
Thin lines show ten-day mean climatology.



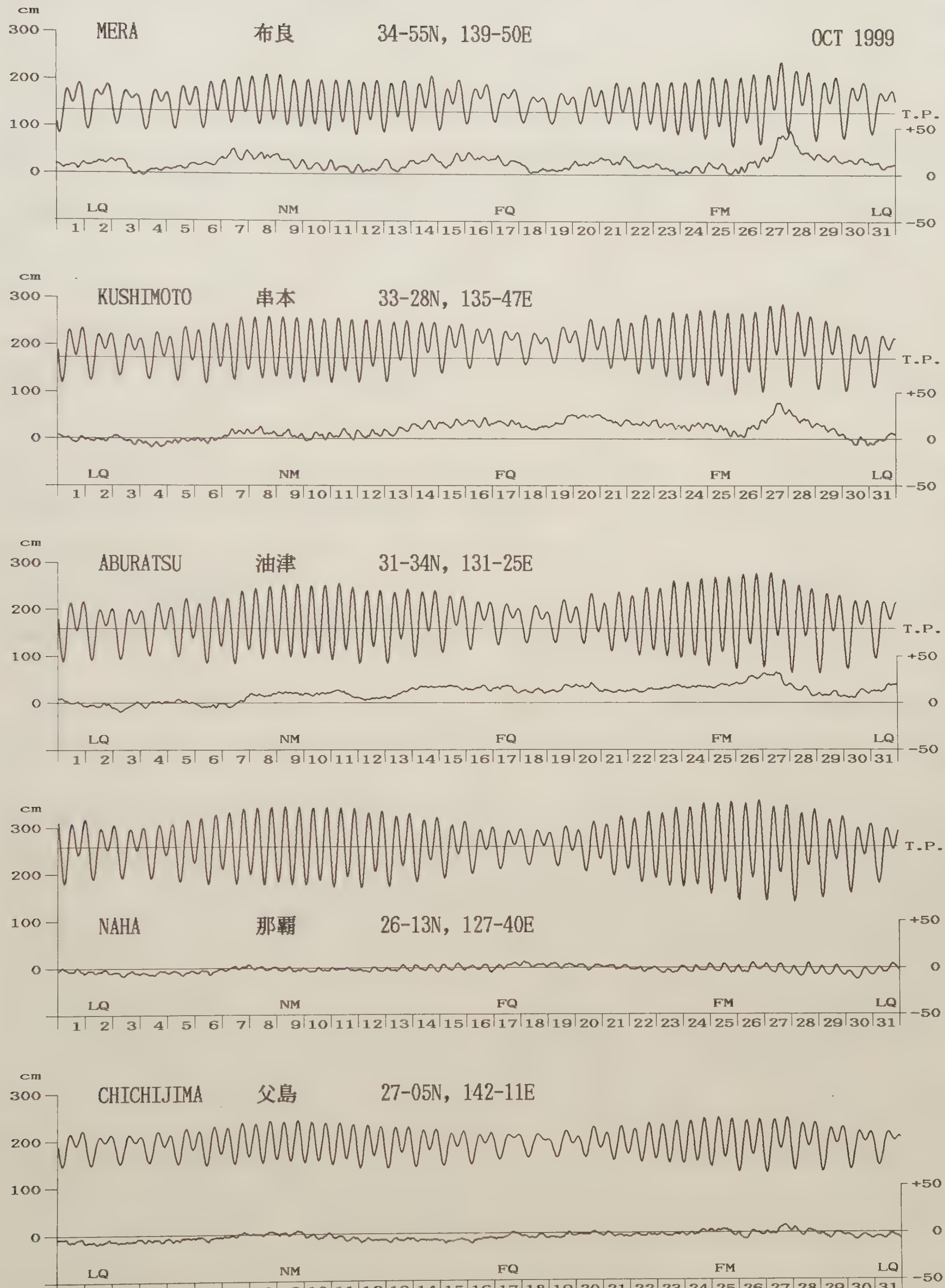
第14図 沿岸潮位時系列図（1999年10月）

Fig.14 Time series of hourly sea level observation (upper line) and its anomalies (lower line) at 9 stations of the JMA in the right panel.
Short term variations are removed from raw data.



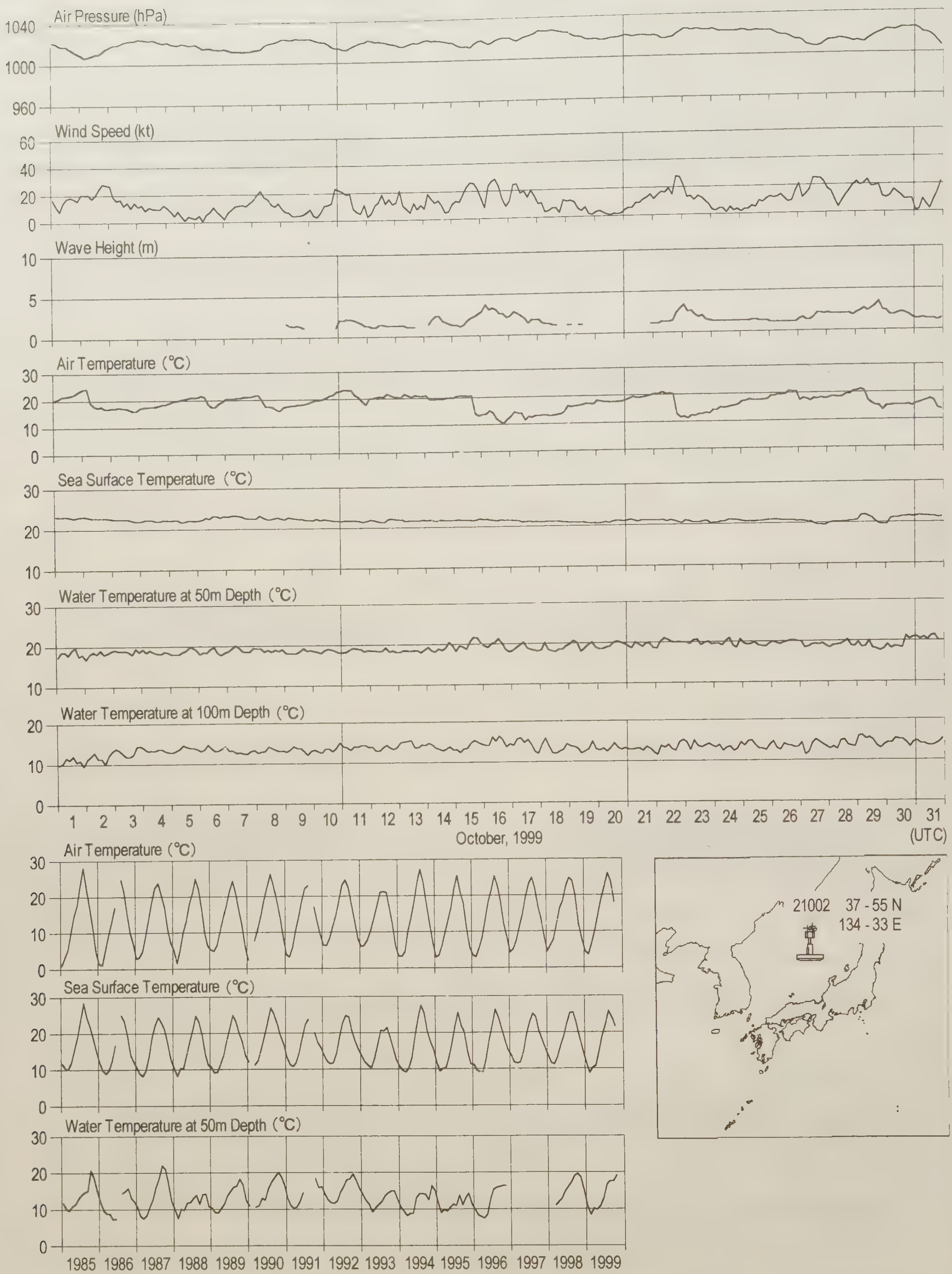
NM: new moon, FQ: first quarter
FM: full moon, LQ: last quarter
T.P.: Mean sea level of Tokyo Bay (Tokyo Peil)

Time series of Sea Level



第14図 つづき
Fig.14 continue

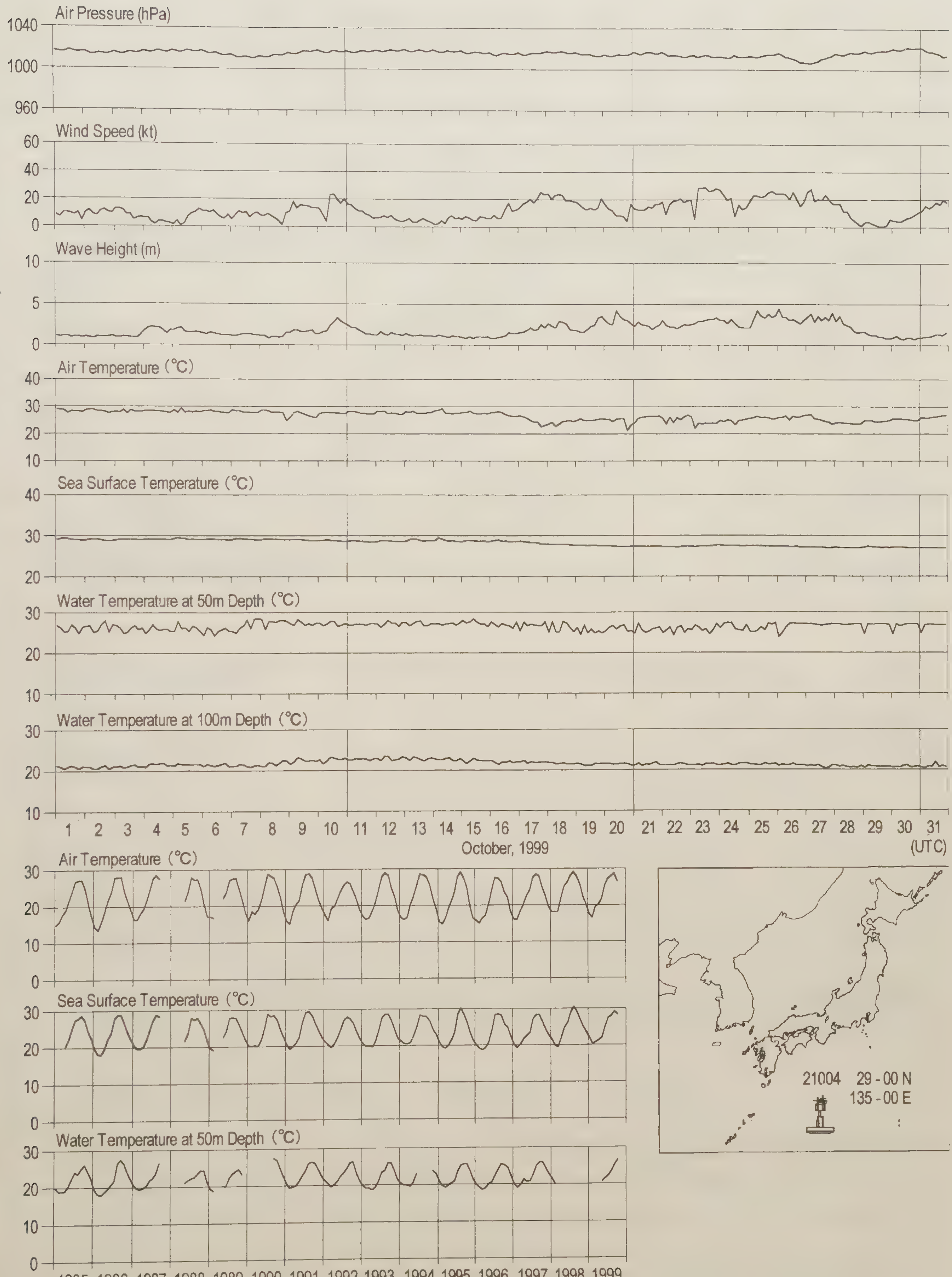
Ocean Data Buoy Observations



第15図　　海洋気象ブイロボットによる観測要素の時系列図（日本海：21002）
上段は３時間毎の観測値を、下段は月平均値を示す。

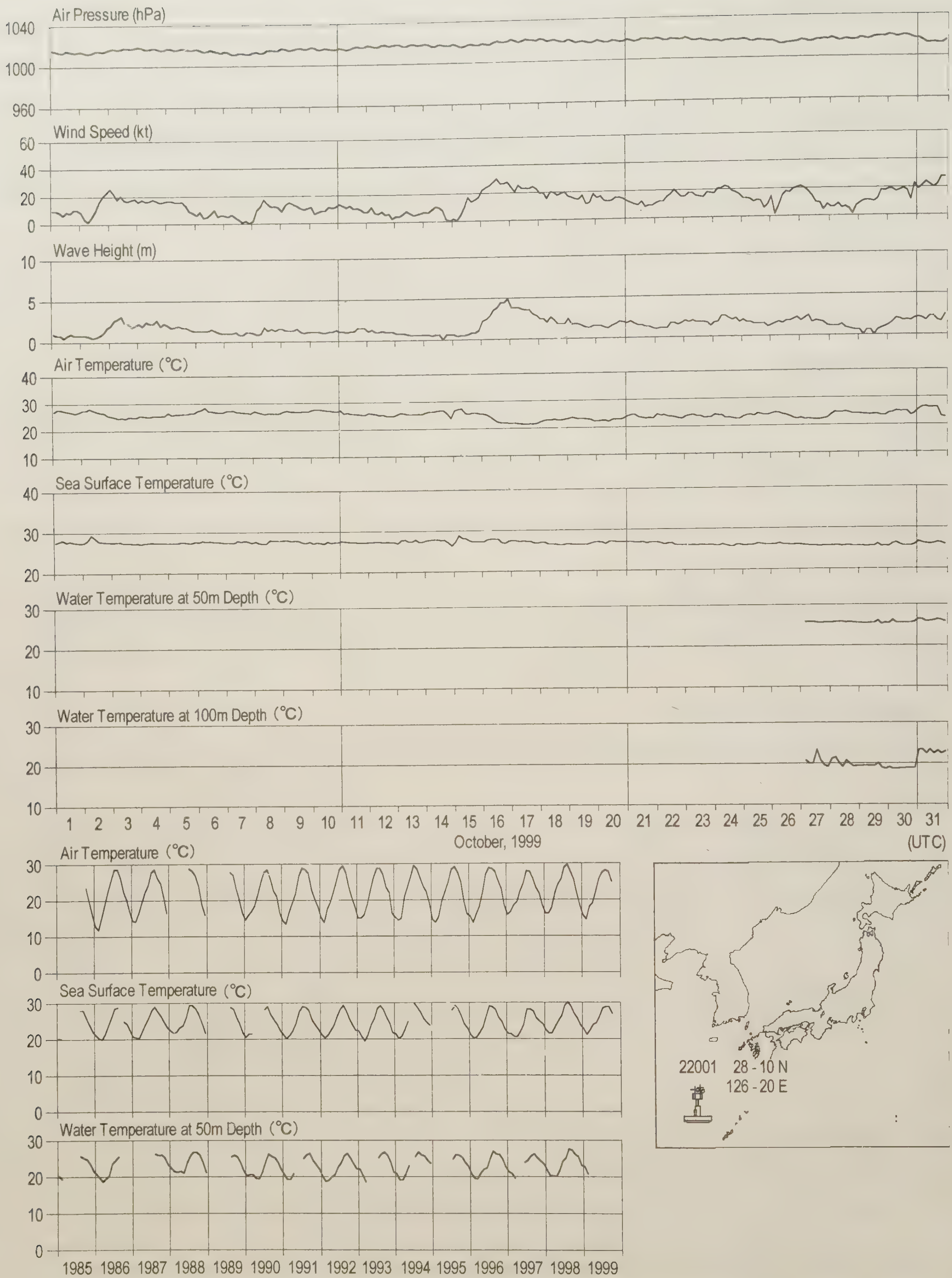
Fig.15　　Time series of JMA buoy observation in the Japan Sea (WMO ID No. 21002).
The upper panel shows three hourly observation and the lower panel shows the monthly mean data.

Ocean Data Buoy Observations



第15図　海洋気象ブイロボットによる観測要素の時系列図（四国沖：21004）
上段は３時間毎の観測値を、下段は月平均値を示す。

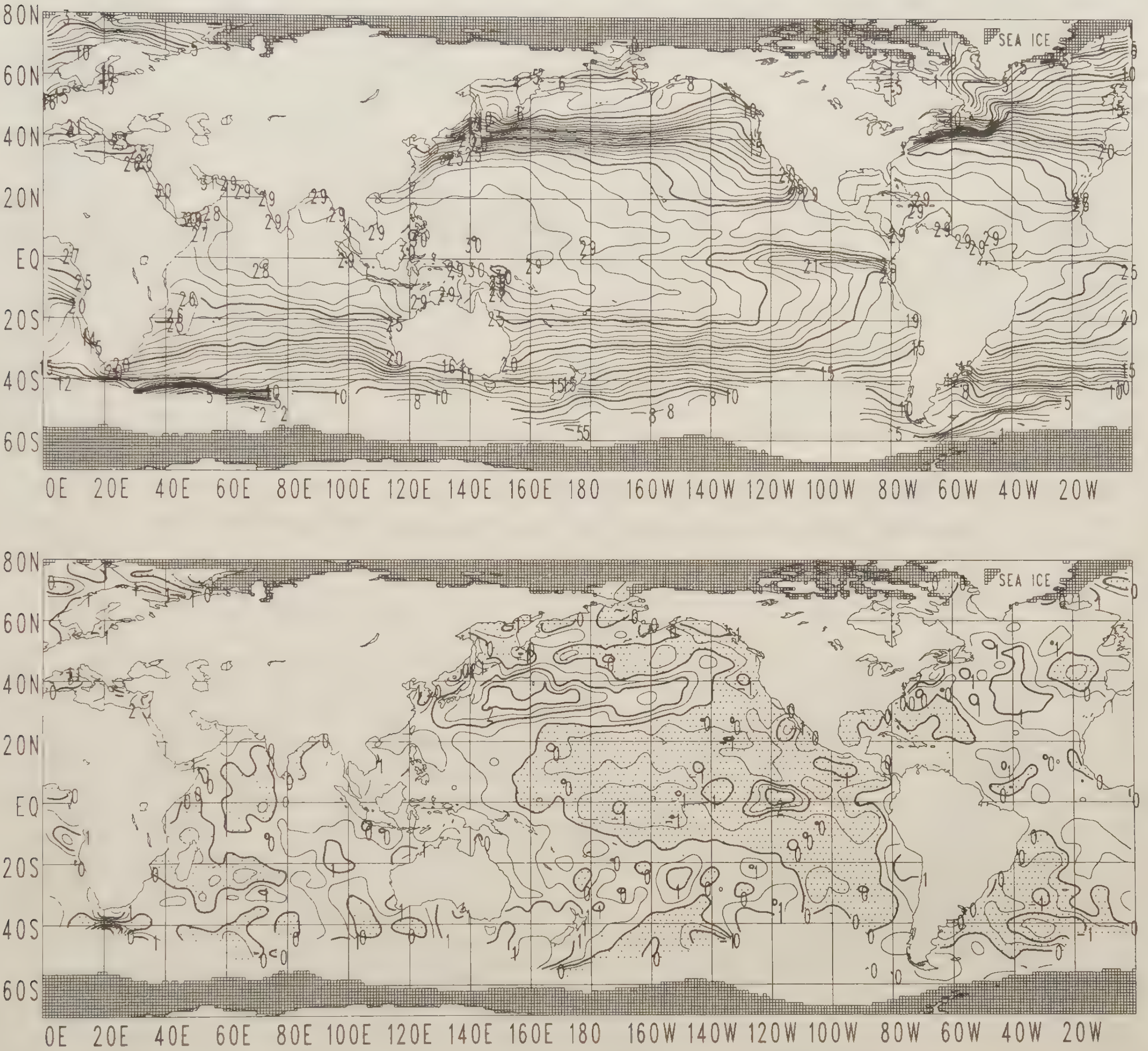
Fig.15　Time series of JMA buoy observation south of Shikoku (WMO ID No. 21004).
The upper panel shows three hourly observation and the lower panel shows the monthly mean data.



第15図　海洋気象ブイロボットによる観測要素の時系列図（東シナ海：22001）
上段は３時間毎の観測値を、下段は月平均値を示す。

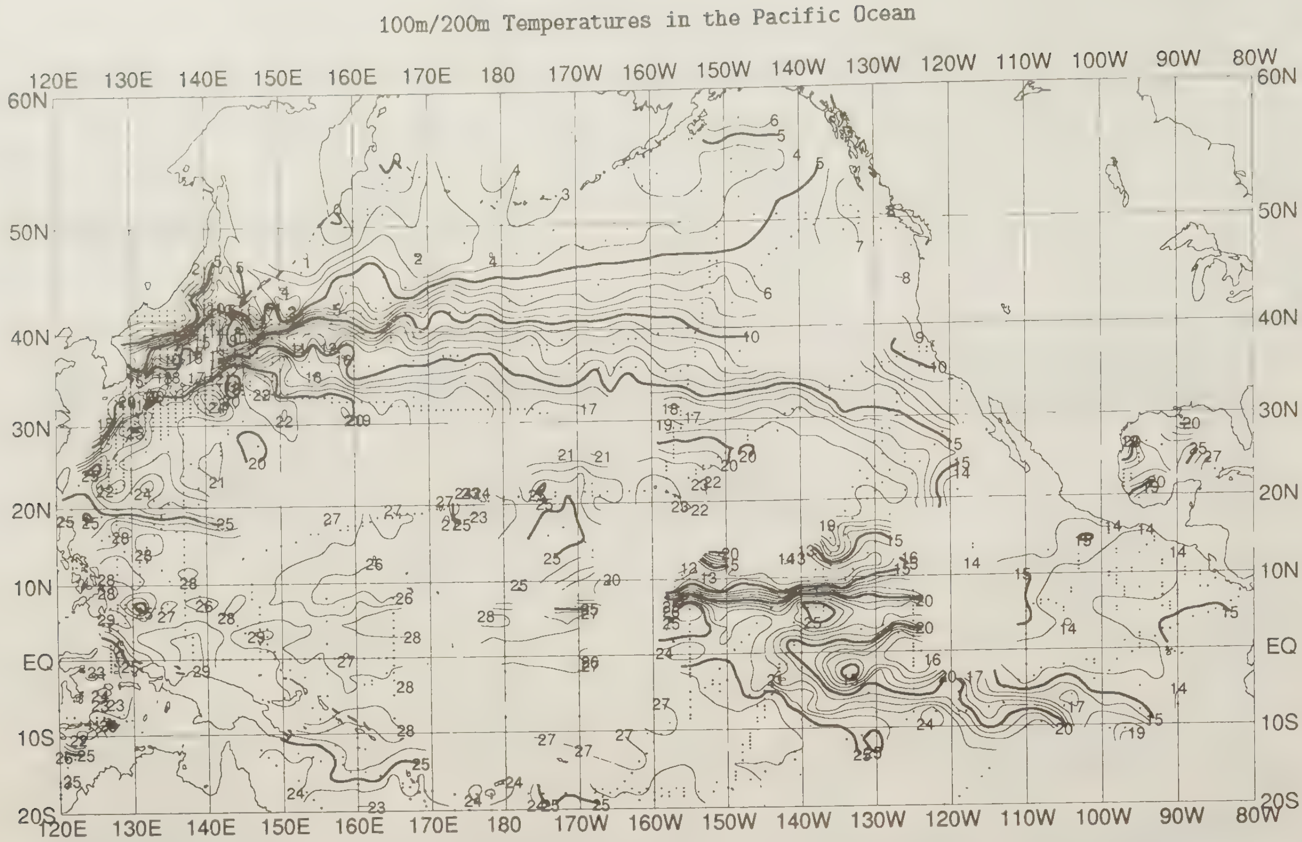
Fig.15　Time series of JMA buoy observation in the East China Sea (WMO ID No. 22001).
The upper panel shows three hourly observation and the lower panel shows the monthly mean data.

SST & Anomalies in the Global Ocean



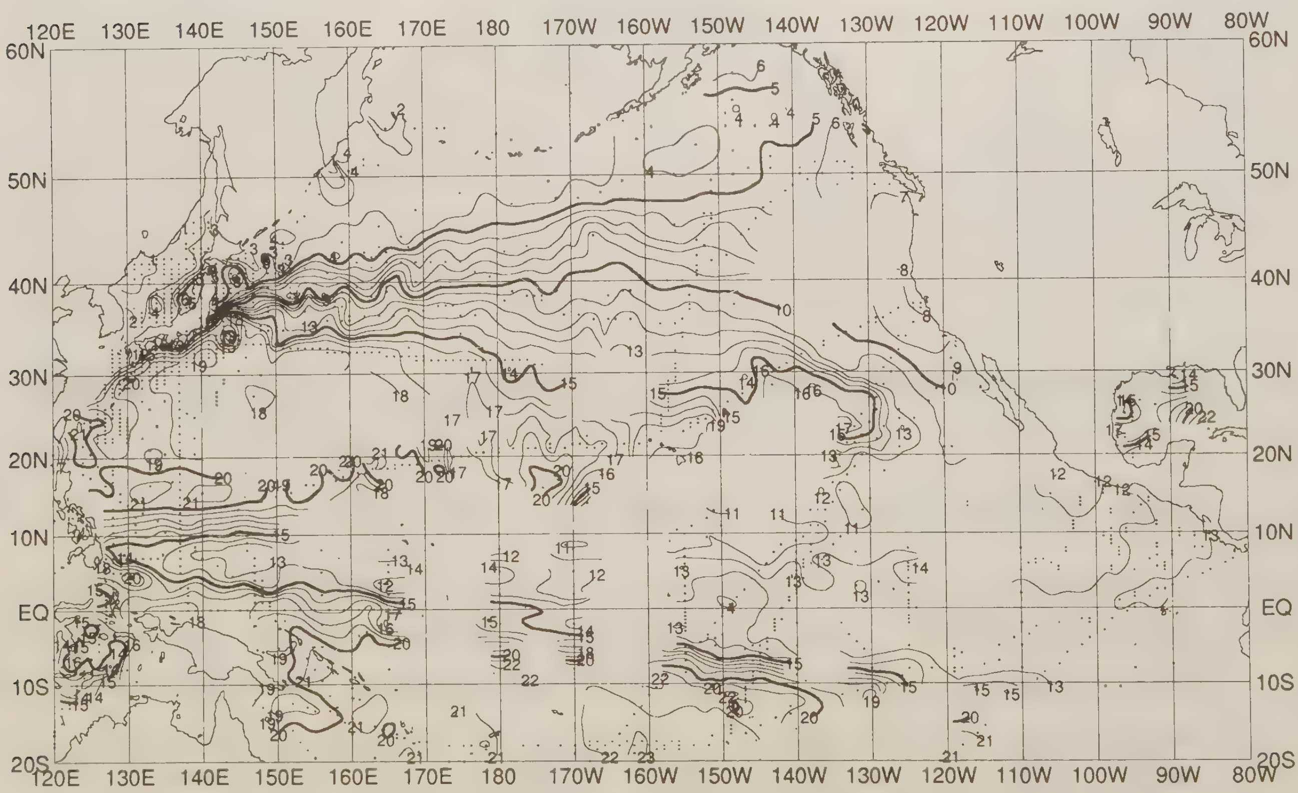
第16図　全球月平均海面水温図（上）及び偏差図（下）（1999年10月）

Fig.16 Monthly mean sea surface temperature over the global ocean (top) and anomalies (bottom) for OCT 1999. Anomalies are computed from the JMA climatology (1961-1990). Contour interval is 1°C (top) and additional anomaly contours of ±0.5°C are shown by thin lines. Negative anomalies are spotted. Maximum coverage of sea ice is shaded. Data sources for sea ice are U.S. National Ice Center (polar regions) and JMA (the Sea of Okhotsk).



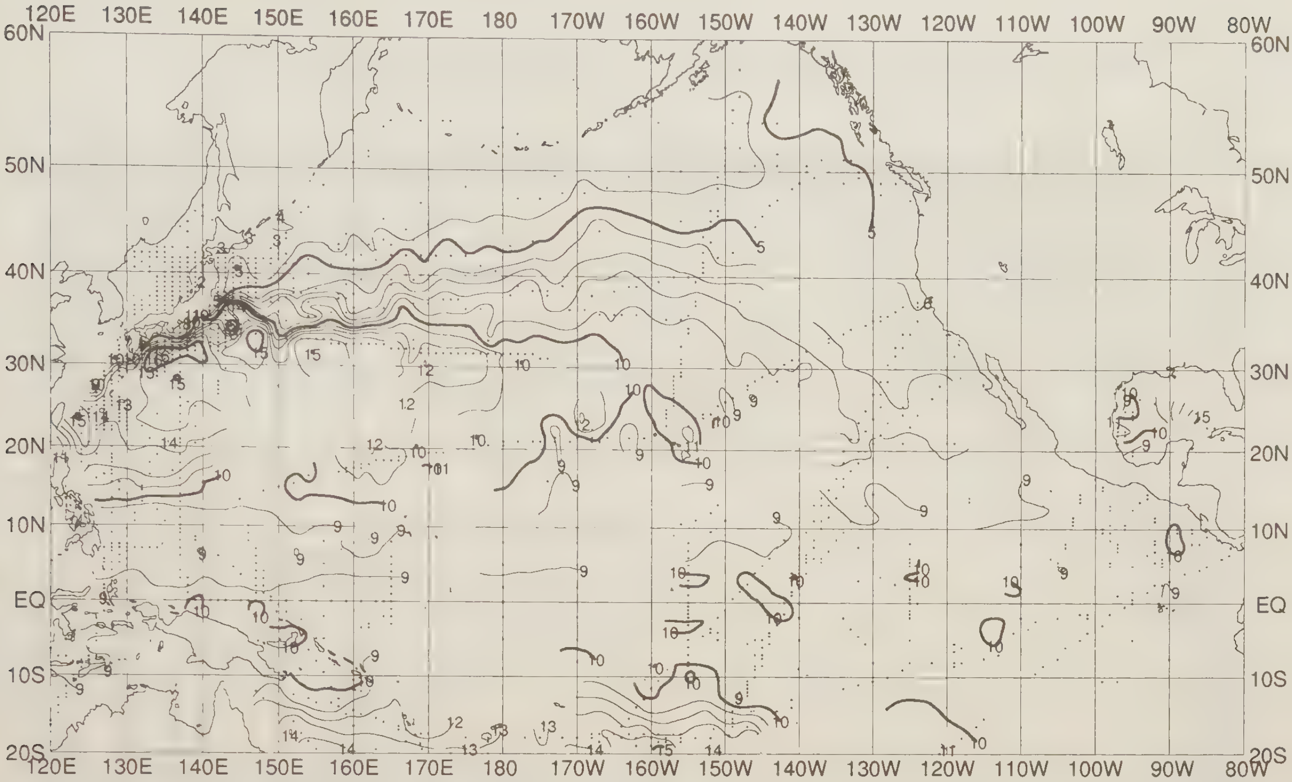
第 17 図　太平洋表層水温図（深さ 100 m）（1999 年 10 月）

Fig. 17　Subsurface (100 m) temperatures in the Pacific Ocean for October 1999. Contour interval is 1 °C. Observation points are denoted by dots.



第 18 図　太平洋表層水温図（深さ 200 m）（1999 年 10 月）

Fig. 18　Subsurface (200 m) temperatures in the Pacific Ocean for October 1999. Contour interval is 1 °C. Observation points are denoted by dots.



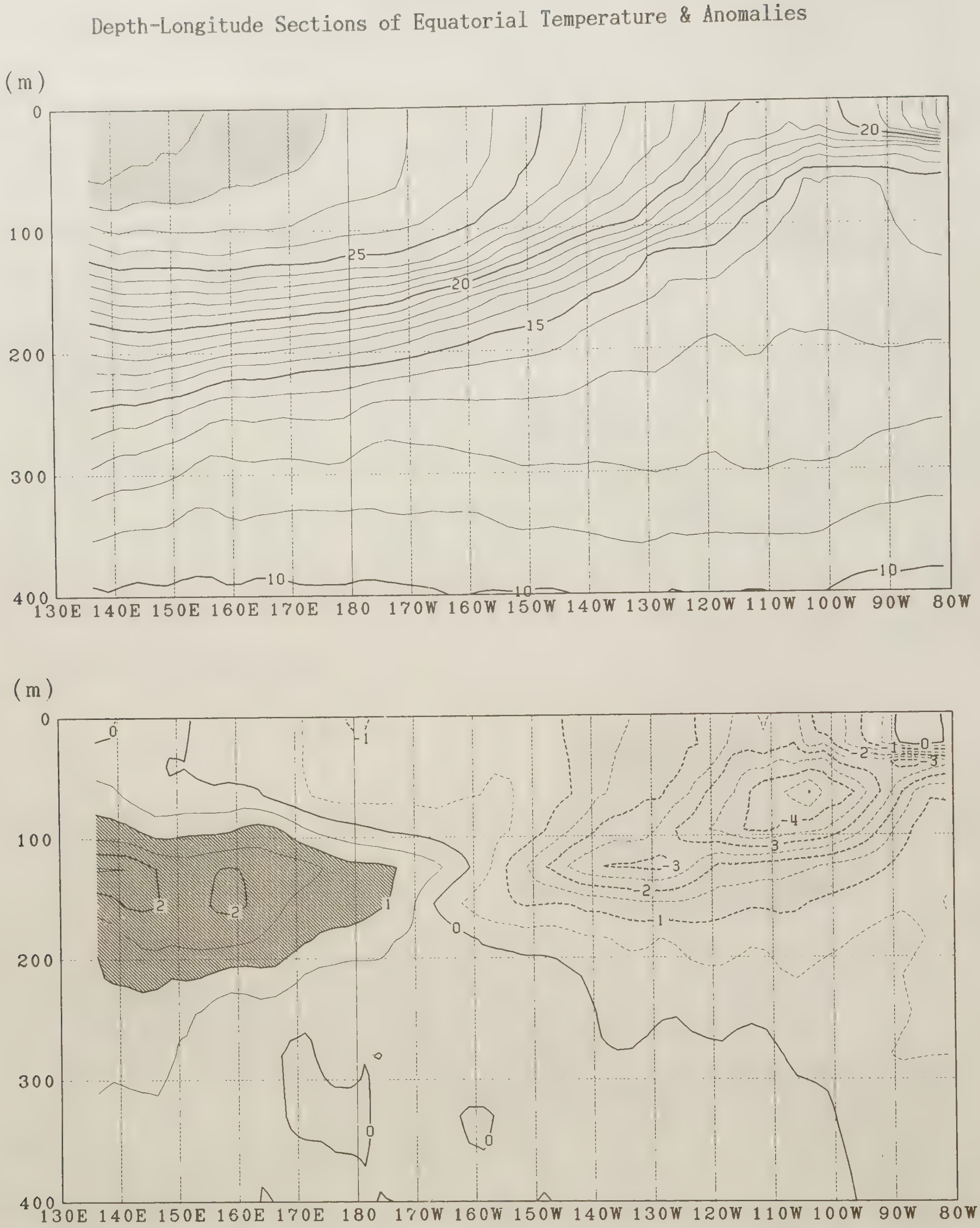
第 19 図　太平洋表層水温図（深さ 400 m）（1999 年 10 月）

Fig. 19　Subsurface (400 m) temperatures in the Pacific Ocean for October 1999. Contour interval is 1 ℃. Observation points are denoted by dots.



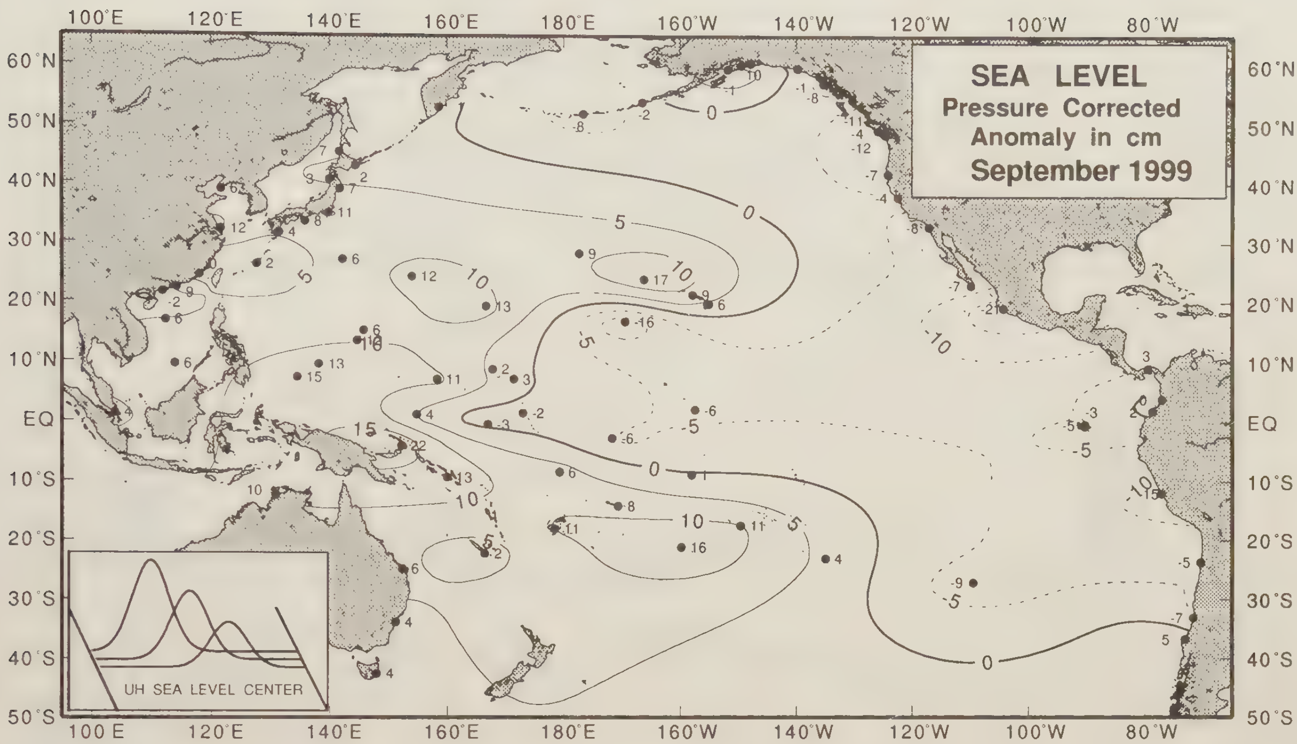
第 20 図　太平洋ブイ流跡図（1999 年 10 月）

Fig. 20　Movements of drifting buoys in the Pacific Ocean during October 1999. Each track is for one buoy. Small circles represent the last positions for the month.



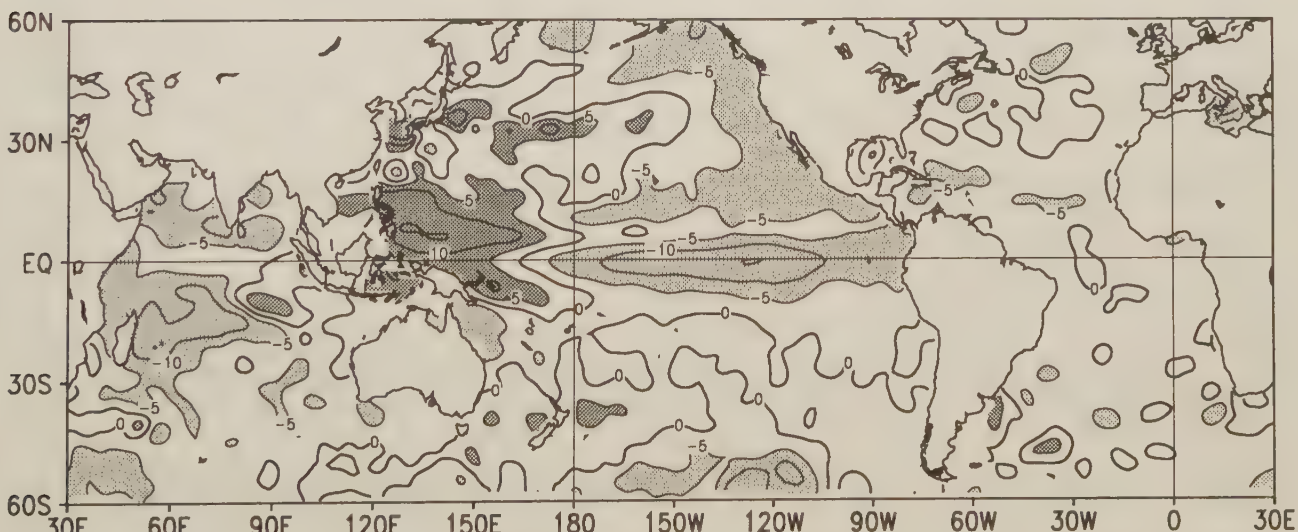
第21図　太平洋赤道に沿う表層水温（上）及び偏差（下）の深度－経度断面図（1999年10月）

Fig.21 Depth-longitude sections of temperature (top) and anomalies (bottom) along the equator in the Pacific Ocean for OCT 1999. Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C (top) and 0.5°C (bottom). Values greater than 28°C in the top panel are shaded. In the bottom panel, values greater than 1°C are shaded and values less than -1°C are spotted. Anomalies are computed from 1987-1998 base period means.



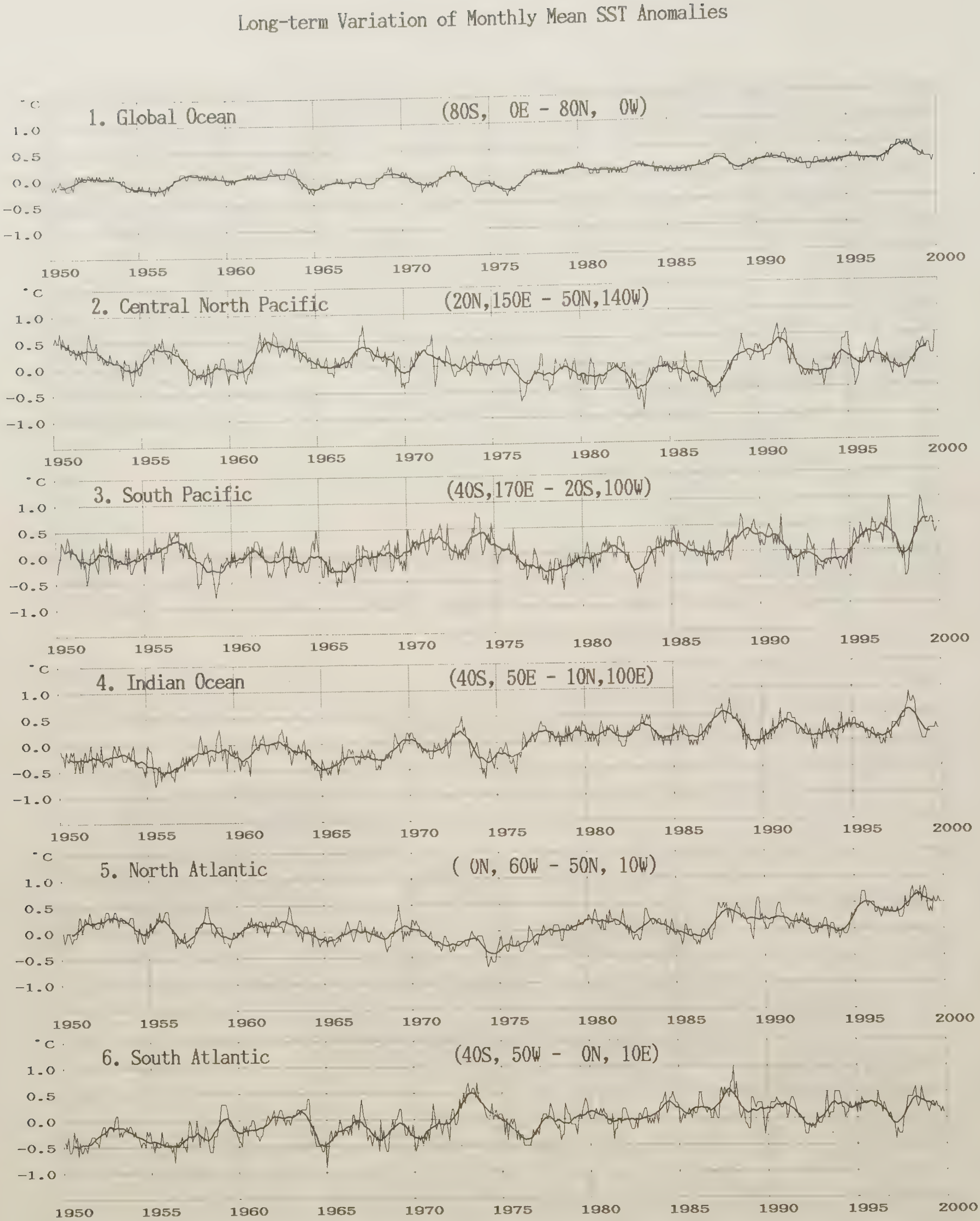
第 22 図　太平洋月平均海面水位偏差図 （1999 年 9 月）

Fig. 22　Monthly sea level anomalies for September 1999 obtained from mean sea level (1975-1995) adjusted for atmospheric pressure. This figure is prepared by the SOC of ISLP-PAC, Department of Oceanography, University of Hawaii.



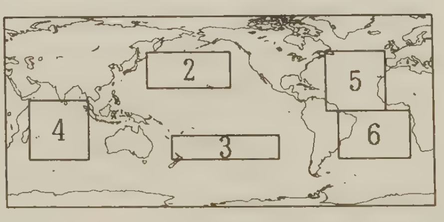
第 23 図　全球月平均海面高度偏差図 （1999 年 9 月）

Fig. 23　Monthly sea surface height anomalies in the global ocean derived from the altimeter data of TOPEX/POSEIDON for September 1999. Contour interval is 5 cm. Positive anomalies exceeding +5 cm are shaded and negative anomalies exceeding -5 cm are spotted. Anomalies are computed from 1993-1998 base period means.

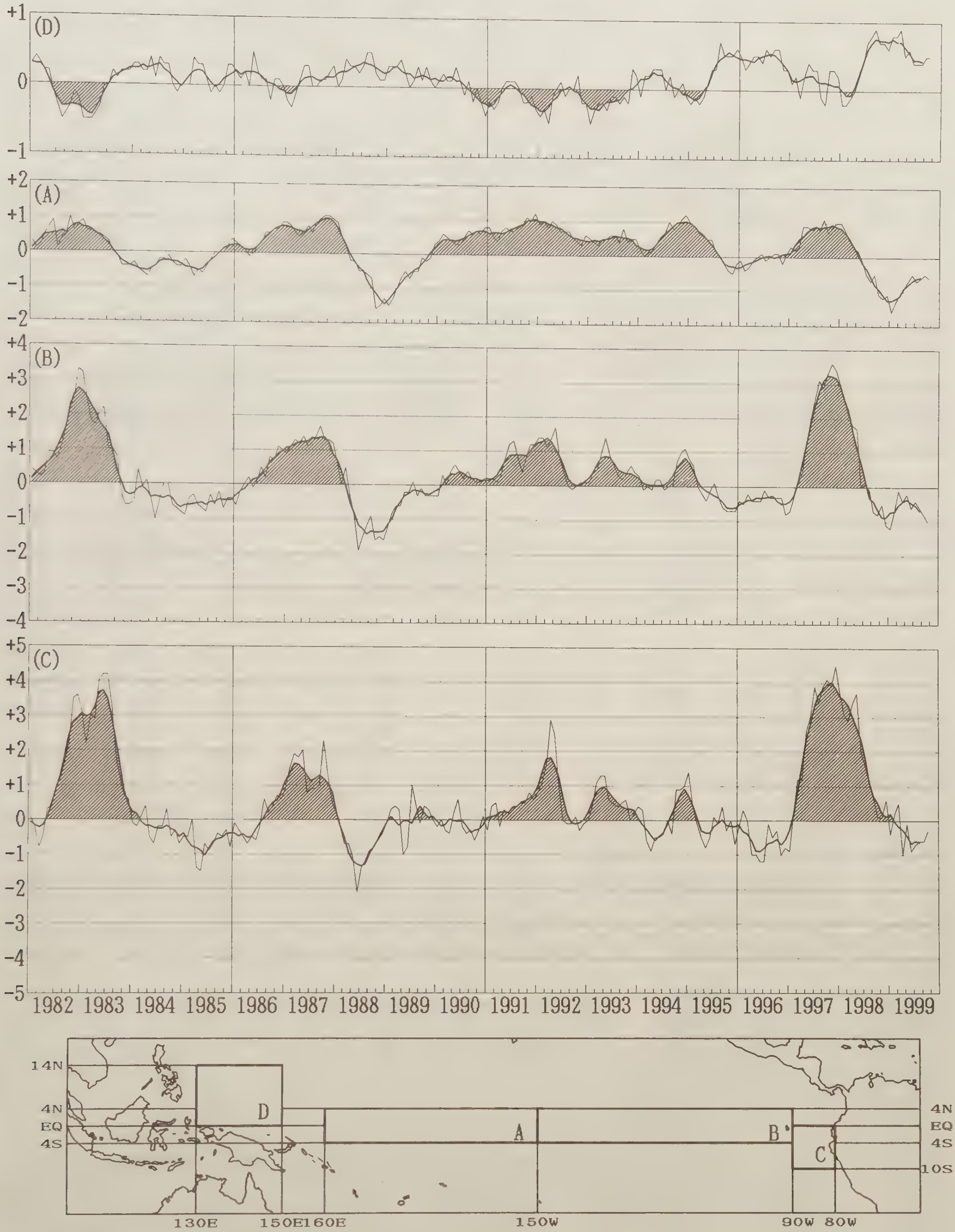


第24図 海域平均海面水温偏差の長期変動

Fig.24 Long-term variations of monthly mean sea surface temperature anomalies (°C) for the areas shown in the right panel. Anomalies are computed from the JMA climatology (1961-90). Thin lines show the monthly mean and thick lines their 13-month running means.



Time Series of Equatorial Pacific SST Anomalies



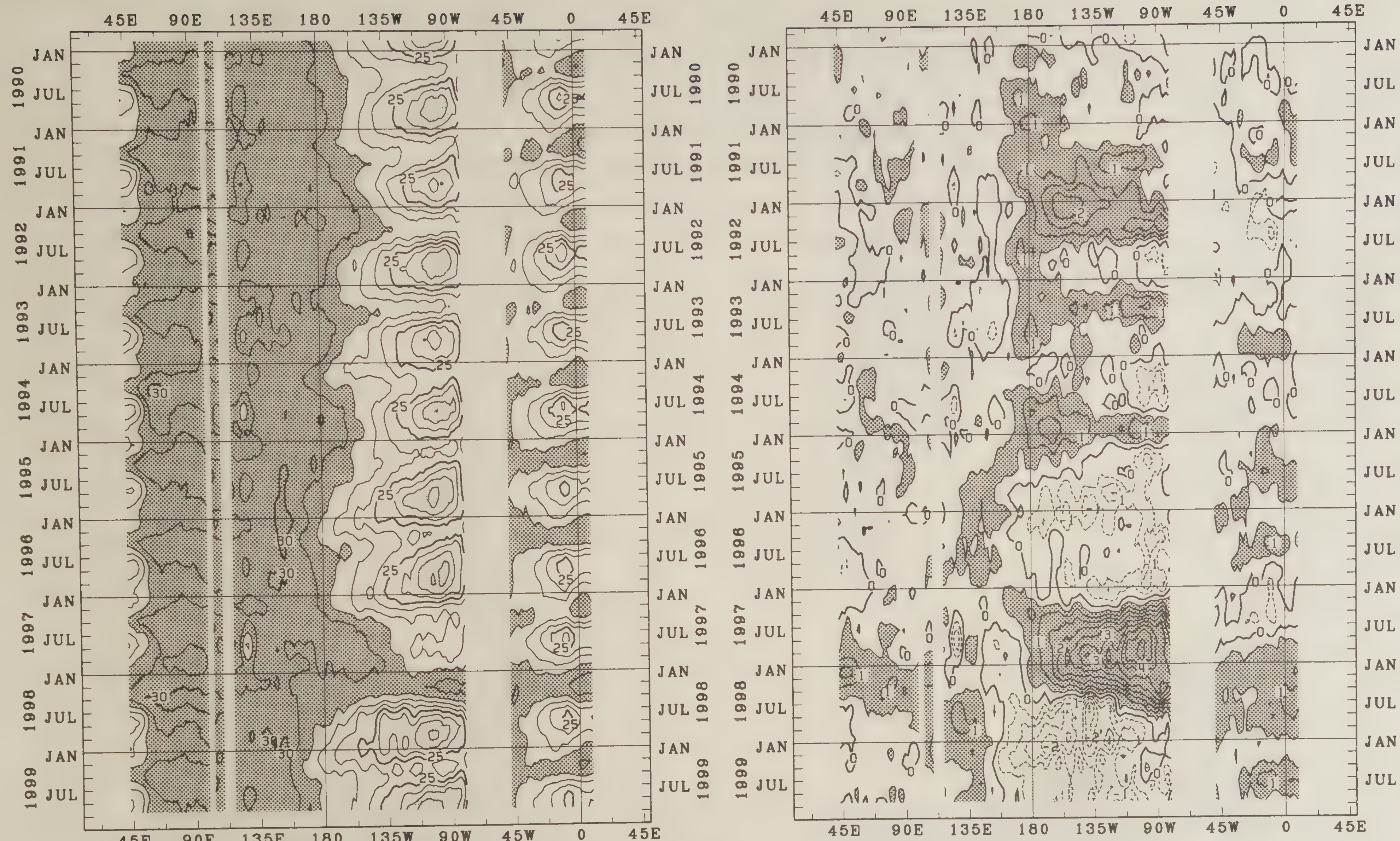
第25図　太平洋赤道域の海面水温偏差時系列図

Fig.25 Time series of monthly mean SST anomalies (°C) in the equatorial Pacific Ocean for the areas indicated at the bottom panel. Thin lines show the monthly means and thick lines their 5-month running means. Positive anomalies (A, B, C) and negative anomalies (D) are shaded. Anomalies are computed from the JMA climatology (1961-1990).

	SEA SURFACE TEMPERATURE AND ANOMALY (°C)								SOI	SEA LEVEL PRESSURE ANOMALY (hPa)	
MONTH	REGION D 14N-EQ 130E-150E		REGION A 4N-4S 160E-150W		REGION B 4N-4S 150W-90W		REGION C EQ-10S 90W-80W		SOI	TAHITI 17-33S 149-37W	DARWIN 12-24S 130-52E
JAN 97	28.6	0.1	28.3	0.3	24.7	-0.7	23.4	-0.9	0.3	1.7	0.9
FEB 97	28.5	0.2	28.2	0.2	25.9	-0.3	25.9	0.2	1.2	1.0	-1.9
MAR 97	28.3	-0.1	28.4	0.3	27.0	0.1	27.1	1.2	-0.6	-0.5	0.9
APR 97	29.0	0.2	29.1	0.9	27.5	0.4	26.3	1.2	-1.1	0.4	2.3
MAY 97	29.5	0.4	29.4	0.9	27.9	1.3	26.5	2.6	-2.5	-2.1	0.9
JUN 97	29.6	0.3	29.3	0.8	28.1	2.0	25.7	3.0	-2.3	-0.8	2.1
JUL 97	29.5	0.3	29.4	0.9	27.8	2.6	25.5	3.9	-0.8	-0.1	1.2
AUG 97	29.0	-0.1	29.2	0.8	27.7	3.1	24.0	3.4	-2.0	-0.9	2.2
SEP 97	29.0	-0.2	29.4	1.1	27.5	2.9	24.2	3.9	-1.4	0.1	2.7
OCT 97	29.6	0.3	29.1	0.7	27.9	3.3	24.8	4.1	-1.6	-0.2	2.7
NOV 97	29.5	0.3	29.3	0.9	28.2	3.6	25.4	3.9	-1.2	0.4	2.7
DEC 97	29.1	0.2	29.2	1.0	28.3	3.4	27.1	4.5	-0.9	-0.5	1.1
JAN 98	28.3	-0.2	29.0	1.0	28.4	3.0	28.0	3.7	-2.3	-3.6	1.4
FEB 98	28.1	-0.2	28.8	0.8	28.8	2.6	28.8	3.1	-1.8	-0.9	3.5
MAR 98	28.3	-0.1	28.6	0.5	29.0	2.1	28.8	2.9	-2.5	-2.8	2.3
APR 98	28.8	0.0	28.5	0.3	28.9	1.8	28.5	3.4	-2.3	-1.5	1.4
MAY 98	29.3	0.2	28.7	0.2	28.3	1.7	27.6	3.7	0.0	0.4	0.5
JUN 98	29.7	0.4	28.4	-0.1	26.1	0.0	24.7	2.0	1.1	0.9	-0.5
JUL 98	29.9	0.7	28.0	-0.5	25.3	0.1	23.2	1.6	1.5	1.8	-0.6
AUG 98	29.9	0.8	27.7	-0.7	24.5	-0.1	21.7	1.1	1.0	1.4	-0.2
SEP 98	30.1	0.9	27.8	-0.5	23.9	-0.7	21.0	0.7	1.0	1.4	-0.4
OCT 98	30.0	0.7	27.3	-1.1	23.8	-0.8	20.8	0.1	1.2	0.8	-1.1
NOV 98	29.9	0.7	27.2	-1.2	24.1	-0.5	21.6	0.1	1.0	0.4	-1.5
DEC 98	29.5	0.6	27.1	-1.1	23.8	-1.1	23.2	0.6	1.5	1.1	-1.5
JAN 99	29.3	0.8	26.4	-1.6	24.2	-1.2	23.9	-0.4	1.5	1.8	-1.5
FEB 99	29.1	0.8	26.7	-1.3	25.5	-0.7	25.9	0.2	0.8	1.3	-0.6
MAR 99	29.3	0.9	27.0	-1.1	26.8	-0.1	26.4	0.5	0.8	0.4	-1.3
APR 99	29.3	0.5	27.3	-0.9	26.7	-0.4	24.1	-1.0	1.8	1.3	-0.9
MAY 99	29.7	0.6	27.8	-0.7	26.4	-0.2	23.8	-0.1	0.3	1.1	1.1
JUN 99	29.7	0.4	28.0	-0.5	25.5	-0.6	21.8	-0.9	0.1	0.6	0.4
JUL 99	29.6	0.4	27.8	-0.7	24.8	-0.4	20.9	-0.7	0.5	1.0	0.1
AUG 99	29.5	0.4	27.8	-0.6	24.0	-0.6	20.0	-0.6	0.0	1.3	1.1
SEP 99	29.7	0.5	27.8	-0.5	23.8	-0.8	19.7	-0.6	-0.1	0.2	0.4
OCT 99	29.8	0.5	27.8	-0.6	23.6	-1.0	20.4	-0.3	1.1	1.2	-0.4

第1表　エルニーニョ監視指数

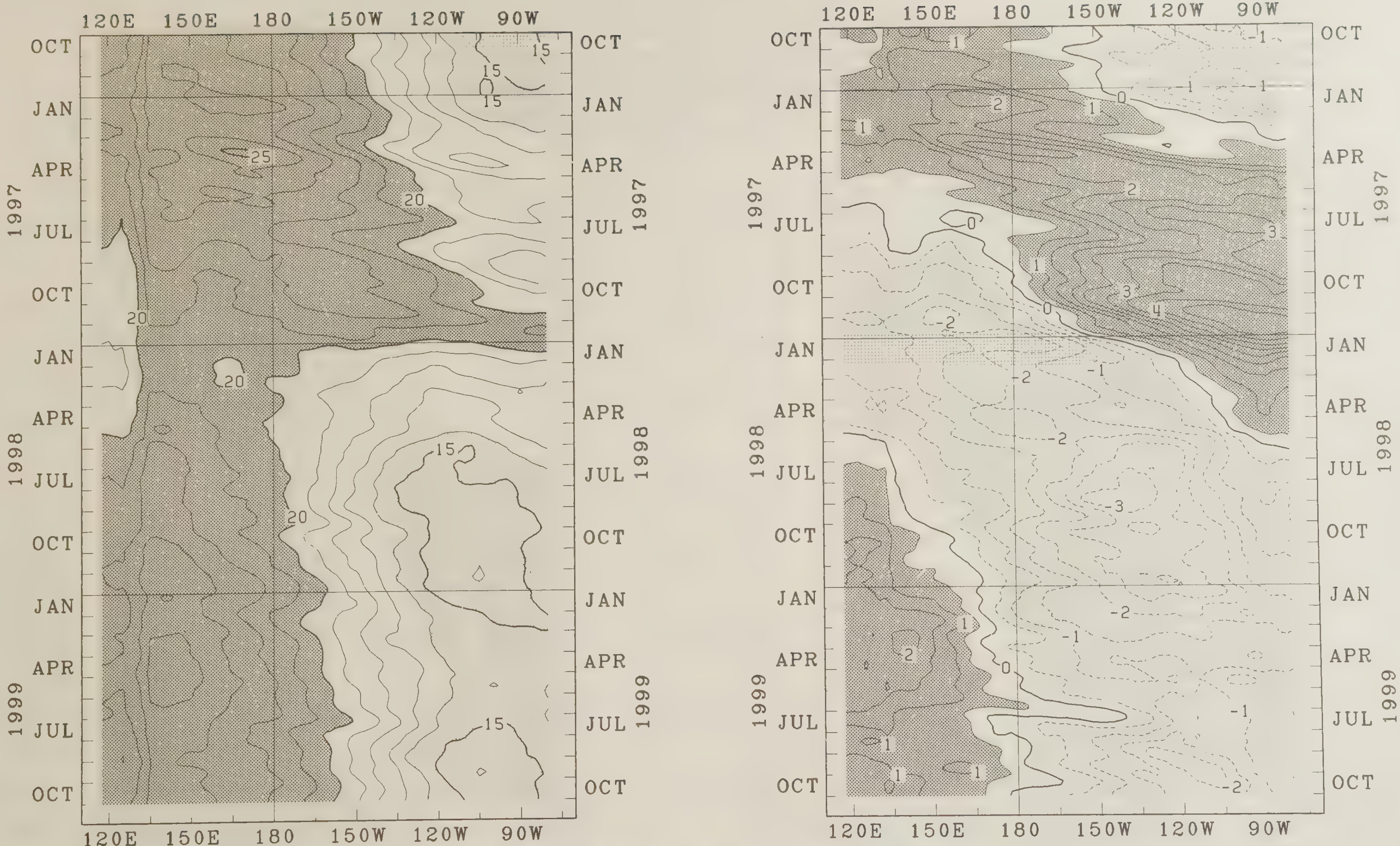
Table 1 El Nino Monitoring indices



第26図　赤道に沿った海面水温（左）及び偏差（右）の時間-経度断面図

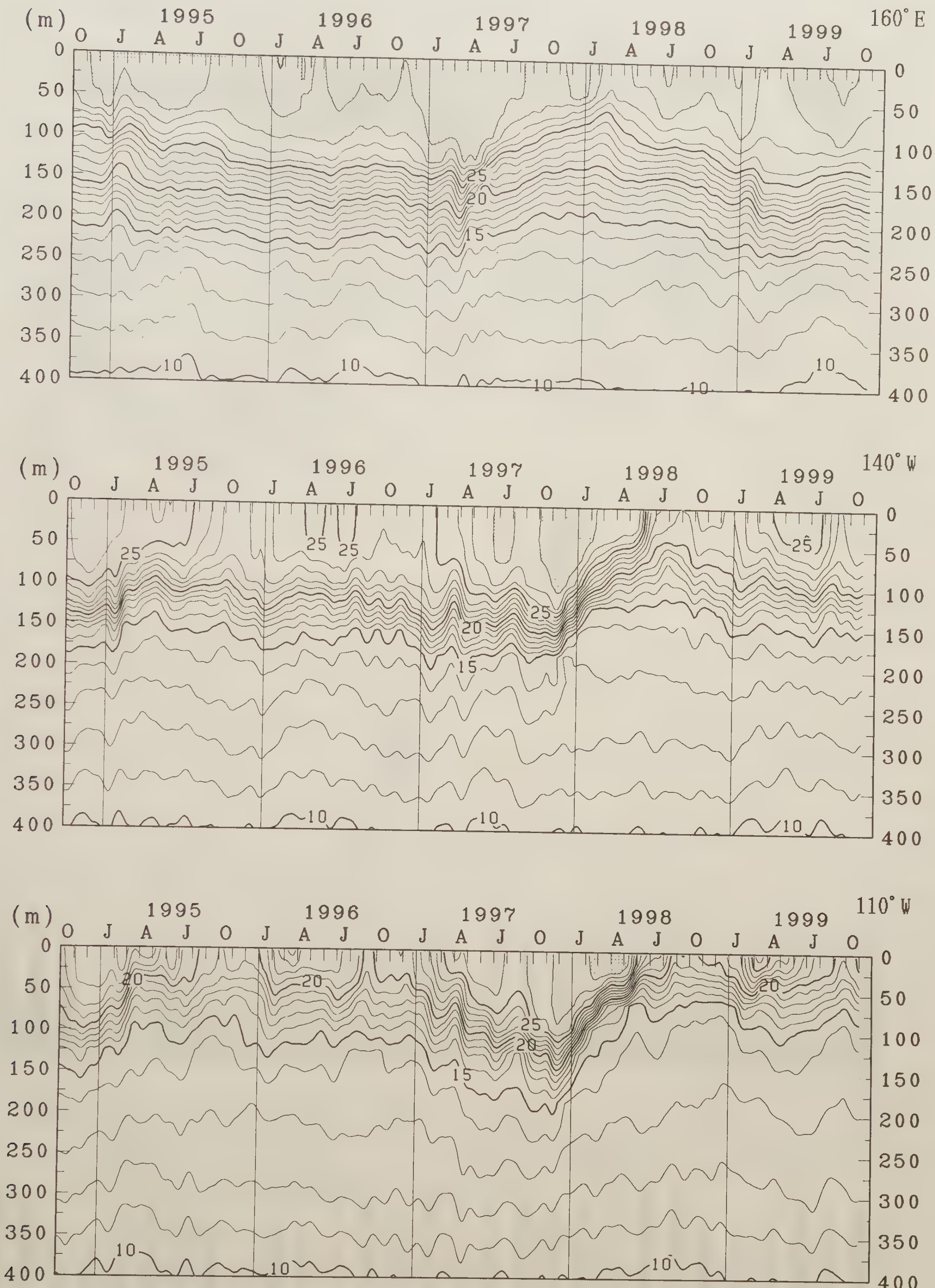
Fig. 26　Time-longitude sections of SSTs (left) and anomalies (right) along the equator (2 °N-2 °S) in the global ocean. Contour interval is 1 °C (left) and 0.5 °C (right). Values greater than 28 °C are shaded and values less than 23 °C are spotted in the left panel. Dashed contours indicate negative anomalies in the right panel. Anomalies are computed from 1961-1990 base period means.

Time–Longitude Sections of Ocean Heat Content & Anomalies (Eq.)



第27図　太平洋の赤道に沿う海洋表層の貯熱量（左）及び偏差（右）の時間－経度断面図

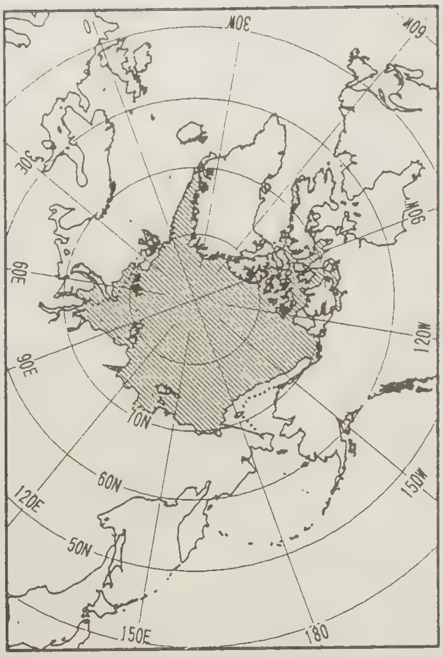
Fig.27 Time-longitude sections of ocean heat content in the upper 260 m along the equator (left) and anomalies (right) in the Pacific Ocean. Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C (left) and 0.5°C (right). Values greater than 20°C are shaded and values less than 16°C are spotted in the left panel. Dashed contours indicate negative anomalies in the right panel. Anomalies are computed from 1987-1998 base period means.



第28図　太平洋赤道域の表層水温の時間－深度断面図

（上：西部、中：中部、下：東部）

Fig.28 Time-depth sections of equatorial subsurface temperature for the western Pacific (top, 160°E), the central Pacific (middle, 140°W) and the eastern Pacific (bottom, 110°W). Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C. Values greater than 28°C are shaded.

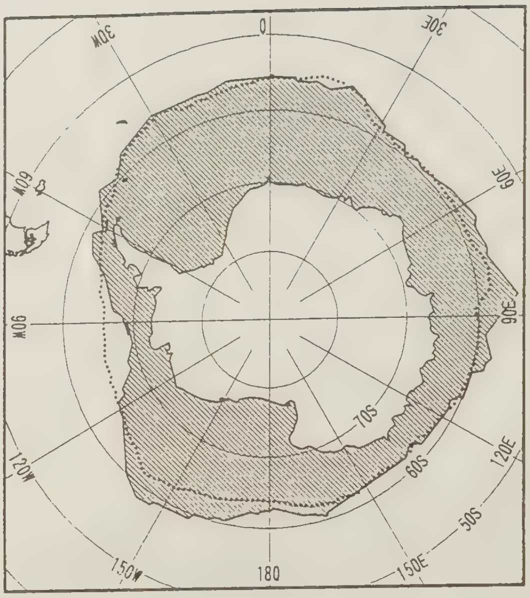


第29-1図　北極域の海氷図（1999年10月14日）

Fig.29-1 Sea ice chart in the Arctic on 14 Oct. 1999.

The shaded area represents the sea ice extent. The dotted line denotes the mean ice edge averaged for the period from 1972 through 1990.

The data source is the National Ice Center (USA).

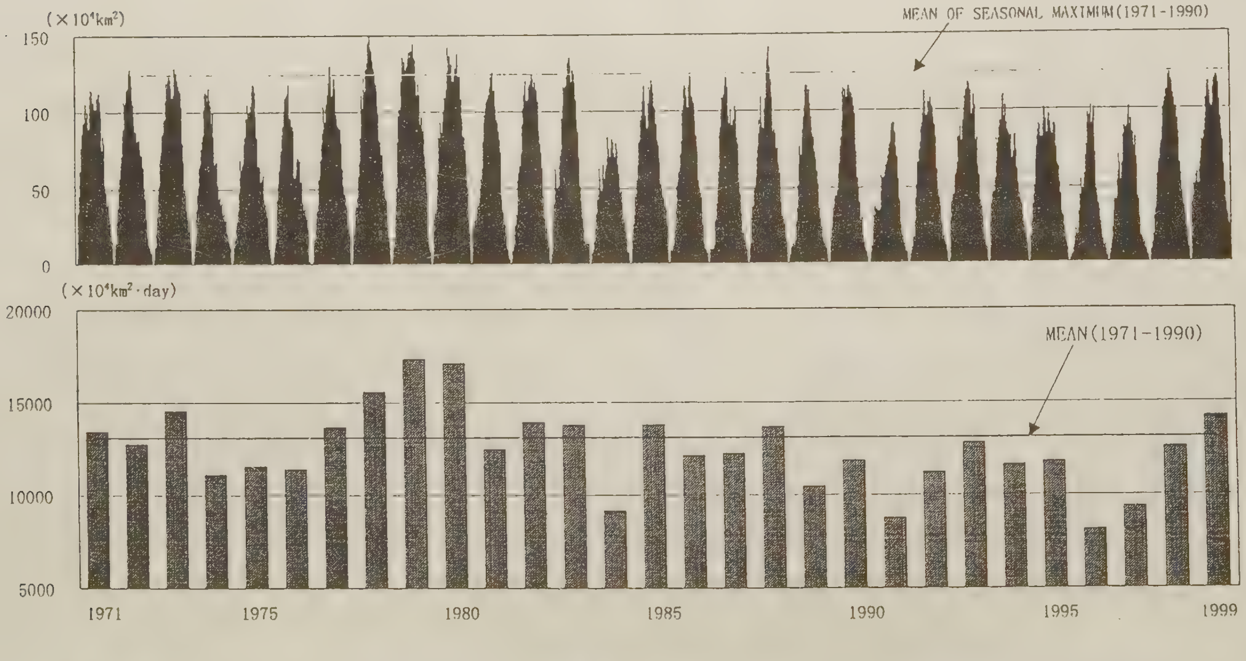


第29-2図　南極域の海氷図（1999年10月15日）

Fig.29-2 Sea ice chart in the Antarctic on 15 Oct. 1999.

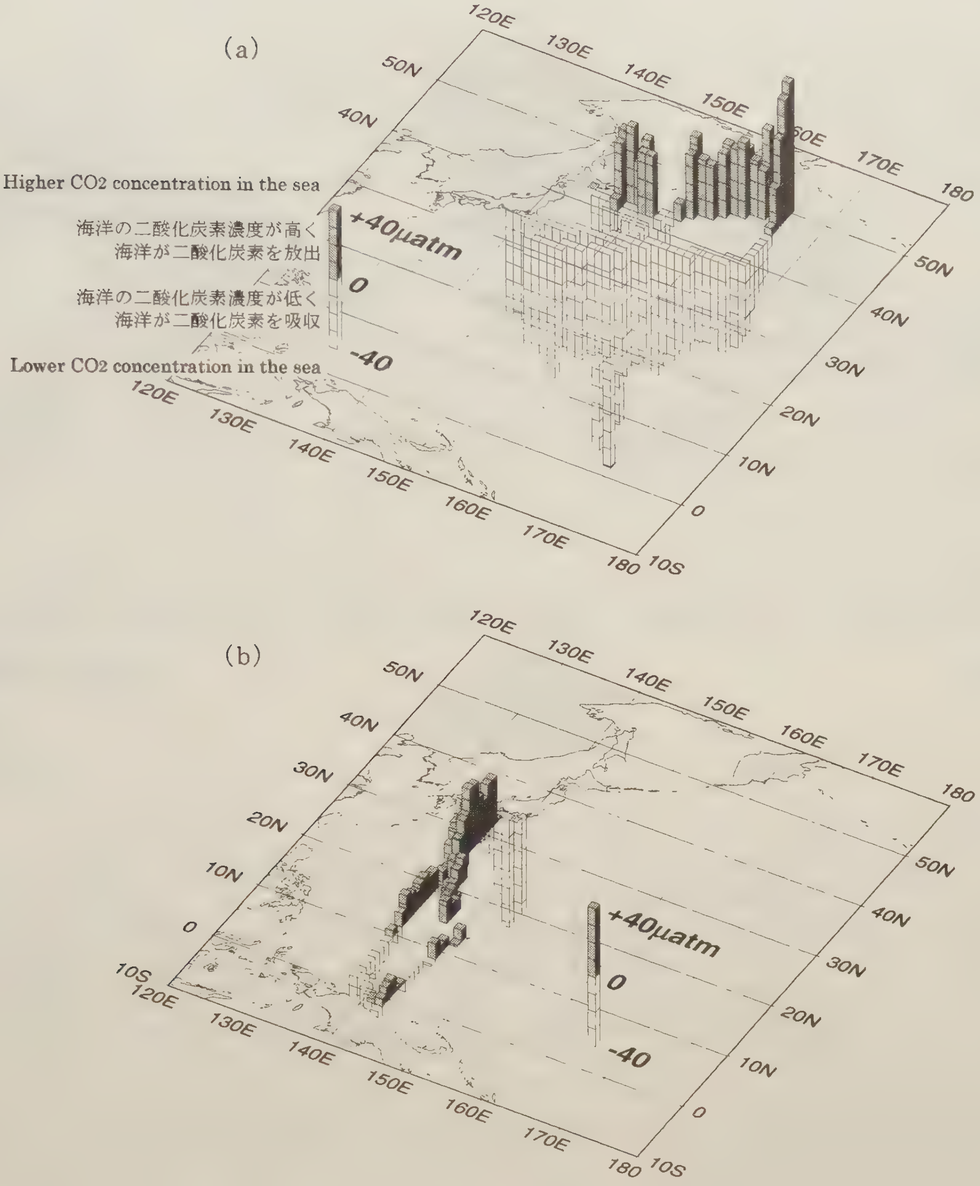
The shaded area represents the sea ice extent. The dotted line denotes the mean ice edge averaged for the period from 1973 through 1990.

The data source is the National Ice Center (USA).



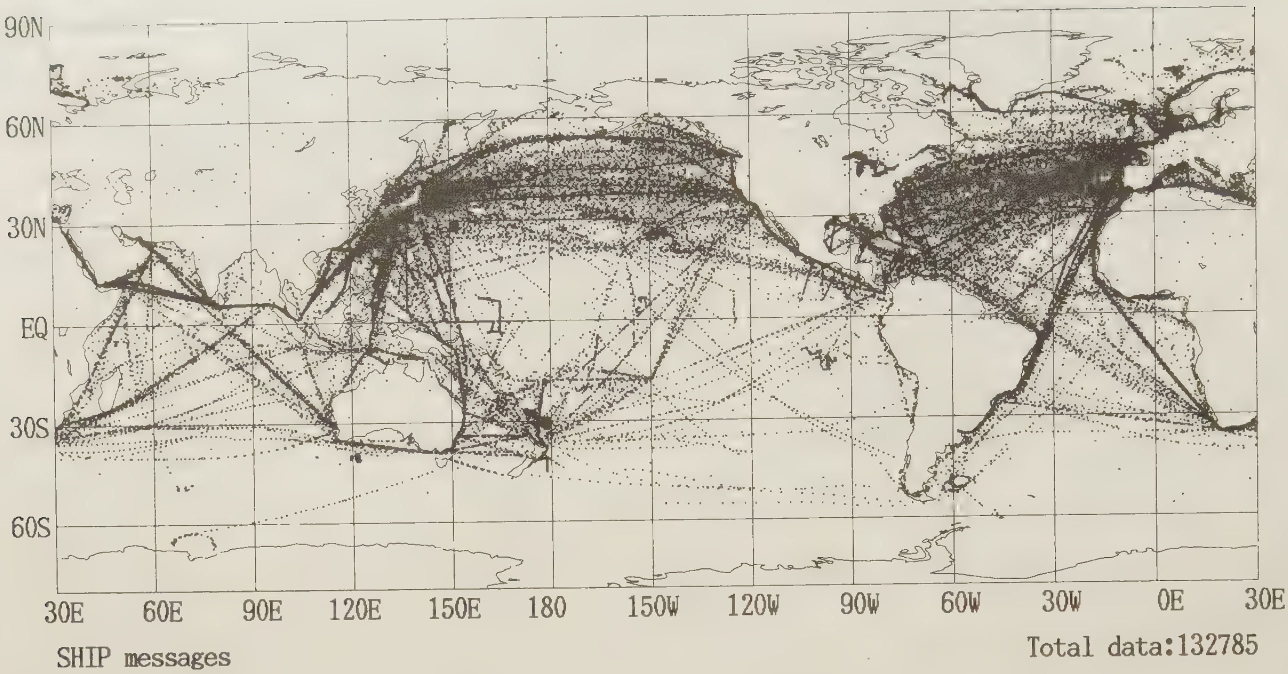
第29-3図 オホーツク海の海氷期の半旬海氷域面積（上段）とその積算（下段）の経年変化

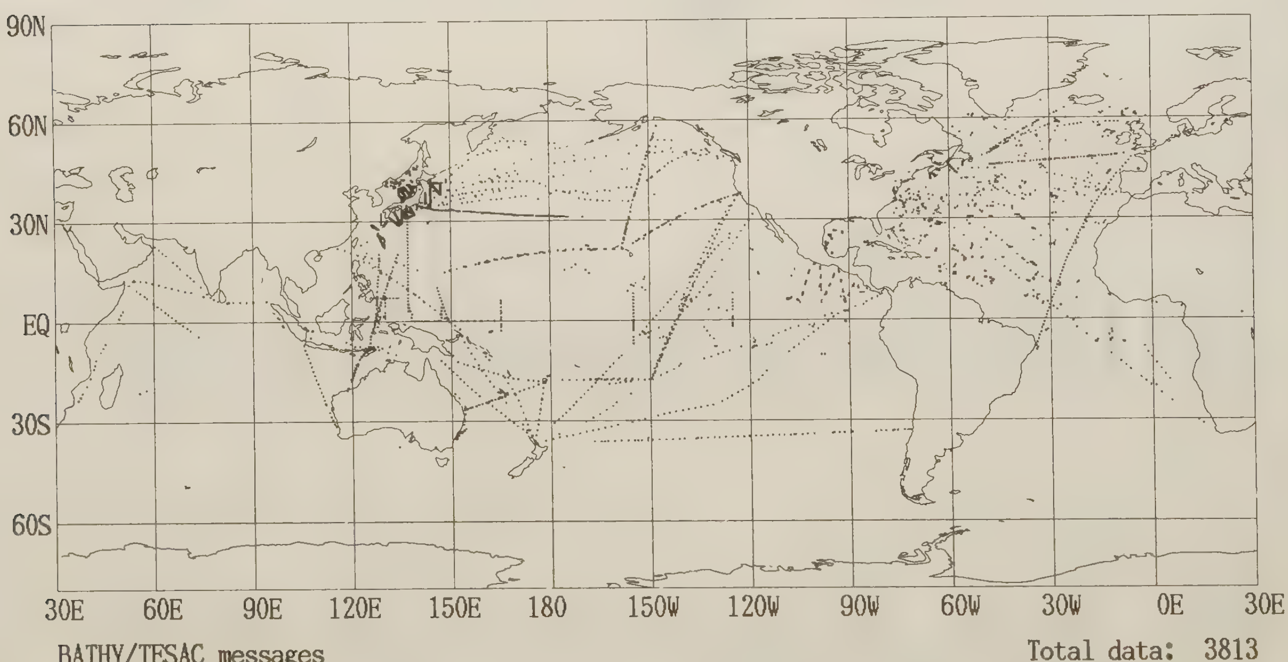
Fig.29-3 Time series of 5-day sea ice extent from December to May (upper) and its accumulation (lower) in the Sea of Okhotsk



第30図　気象庁の海洋気象観測船「凌風丸」が，(a) 1999年4月23日から5月24日にかけて，(b) 1999年6月23日から7月21日にかけて北西太平洋で観測した洋上大気中と表面海水中のCO_2の濃度差。棒グラフは，海洋から大気へCO_2を放出する場合を濃い陰影，および海洋が大気のCO_2を吸収する場合を薄い陰影に示してある。

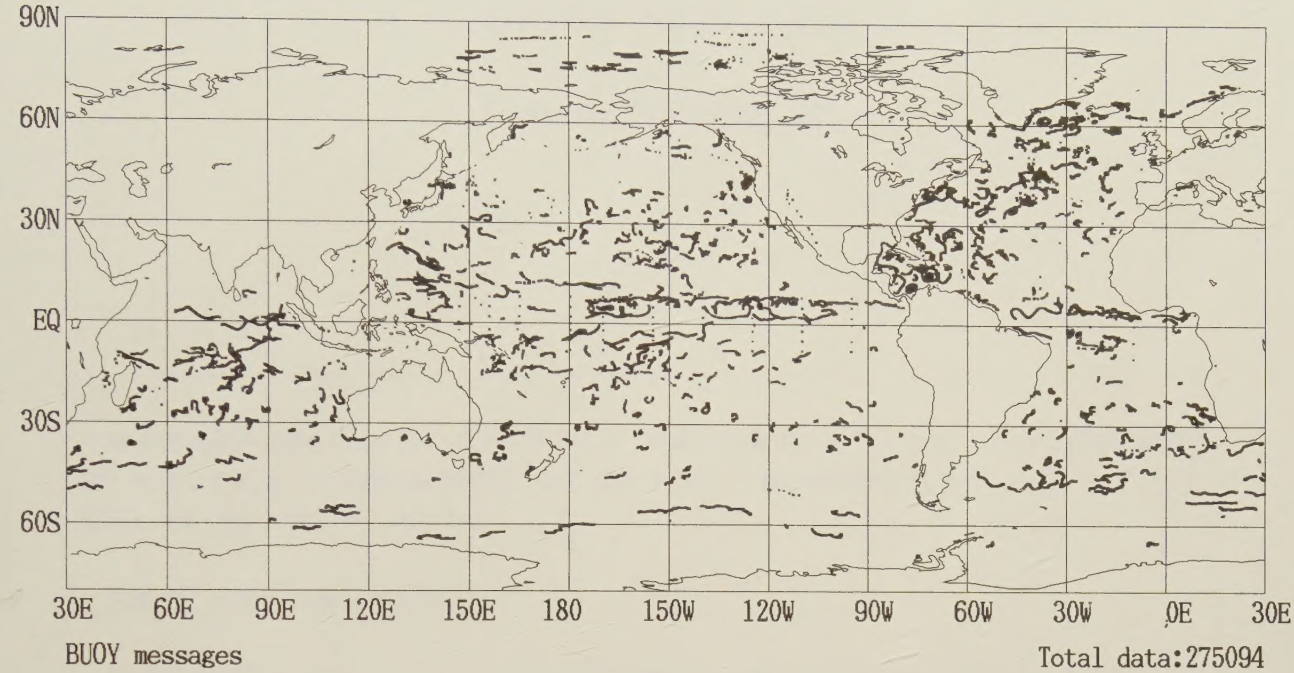
Fig. 30　Difference in the CO_2 concentration between the surface water and the overlying atmosphere in the western North Pacific observed by the R/V Ryofu Maru of JMA, (a) from April 23 to May 24, 1999, (b) from June 23 to July 21, 1999. Darker-shaded upward pillars indicate that the oceanic CO_2 was emitted into the atmosphere, and lighter-shaded downward pillars indicate that the atmospheric CO_2 was absorbed into the ocean, respectively.

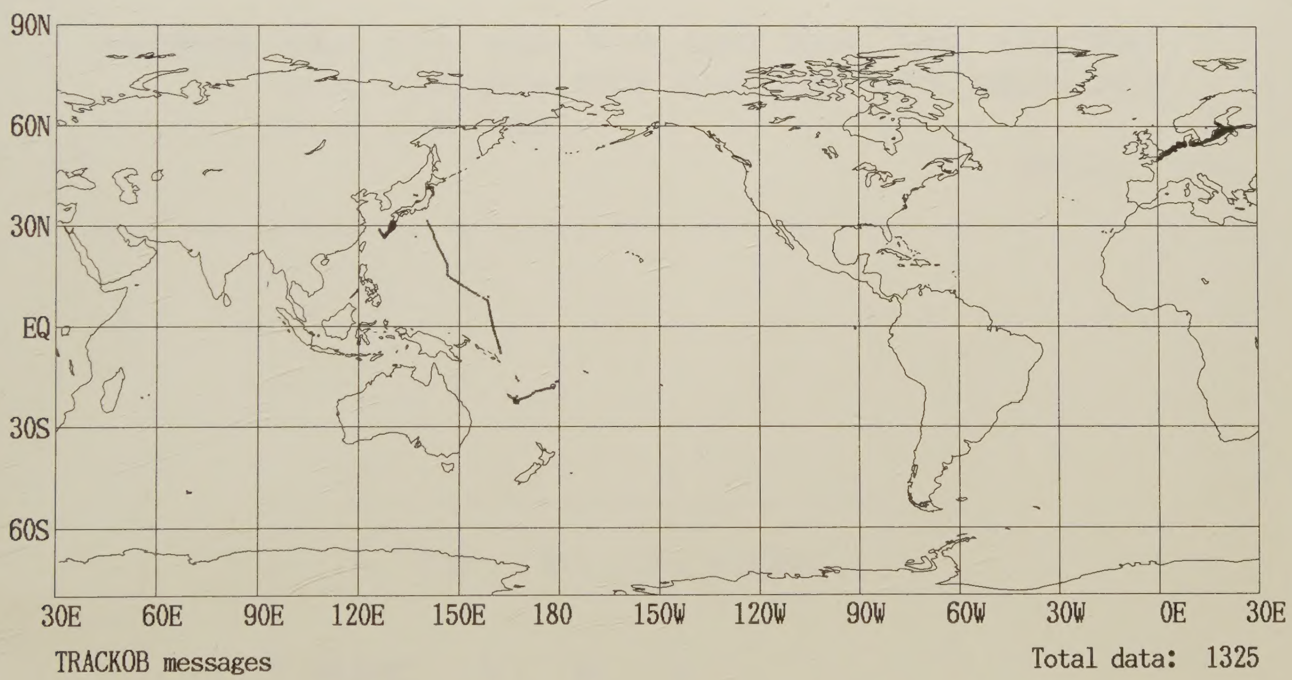




第31-1図　測点分布図(1999年10月)

Fig.31-1 Geographical distribution of SHIP messages (SST data, top) and BATHY/TESAC messages (subsurface temperature data, bottom) for OCT 1999.





第31-2図 測点分布図(1999年10月)

Fig.31-2 Geographical distribution of BUOY messages (buoy drift and SST data, top) and TRACKOB messages (ship drift and SST data, bottom) for OCT 1999.

気象庁海洋月報

Monthly Ocean Report

October 1999 (No. 82)

本月報掲載の1999年10月のプロダクトには、気象庁が観測したデータ及びGTS（全球気象通信網）を通じて入手した国際気象通報式による通報のほか、下記の機関等から提供いただいたデータを使用しています。御礼申し上げます。

防衛庁、水産庁、海上保安庁

海洋科学技術センター、（財）日本海洋科学振興財団、（社）漁業情報サービスセンター

東北大学、東京水産大学、鹿児島大学

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